EXPORT GROWTH, ECONOMIC GROWTH AND REAL EXCHANGE RATE IN INDONESIA

by

KENNETH WING-KEUNG LO

in

FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

CITY UNIVERSITY
DEPARTMENT OF BANKING AND FINANCE
CITY UNIVERSITY BUSINESS SCHOOL
UNITED KINGDOM

AUGUST 2000

TABLE OF CONTENTS

CONTENTS *i*

TABLES *v*

FIGURES *viii*

ACKNOWLEDGEMENTS *ix*

ABSTRACT *x*

CHAPTER 1 INTRODUCTION

1.1	Executive Summary	1
1.2	Outline of the Texts	2
1.3	Recent Economic Crisis	8
1.4	Aftermath	11
Notes		14
Tables		15

CHAPTER 2 THE BACKGROUND: TRADE AND INVESTMENT REFORMS AND EXCHANGE RATE POLICIES IN INDONESIA

2.1	The Background	17
2.2	Trade and Investment Reforms	18
2.2.1	Chronology of the Trade and Investment Reforms	18
2.2.2	Impacts of Trade and Investment Reforms to Export Growth	19
2.3	Exchange Rate Policies and the Economic Adjustments	20
2.3.1	Two Major Devaluations in 1980s	21
2.3.1.1	The 1983 Devaluation	21
2.3.1.2	The 1986 Devaluation	21
2.4	Some Stylised Facts	22
2.5	Conclusion	25
Note		27
Tables		28
Figures		30

CHAPTER 3 EXPORT PERFORMANCE AND ECONOMIC GROWTH

3.1	Export, Growth and Trade Liberalization in Indonesia	36
3.2	Determinants of Export-Led Growth:: Balance of Payment Constrained Growth Model	40
3.2.1	Methodology	44
3.2.2	Empirical Results	45
3.3	Determinants of Export Growth:: The Neoclassical Export-Growth Synthesis	46
3.3.1	The Expanded Model	48
3.3.2	Non-Nested Regression Test	51
3.3.3	Empirical Results	51
3.4	The Issue of Interpolation	53
3.5	Conclusion	56
Appendix		58
Notes		63
Tables		65

CHAPTER 4 A STUDY OF EXPORT GROWTH: CAUSALITY AND COINTEGRATION TESTS

4.1	Introduction	83
4.2	Literature Survey	84
4.3	Data Sources	87
4.4	Methodology	87
4.4.1	Causality Issues	87
4.4.1.1	Granger Causality and Test	88
4.4.1.2	Sims's Causality and Test	89
4.4.1.3	Geweke, Meese and Dent (GMD) Test	90
4.4.2	Causality and Cointegration	91
4.4.2.1	Cointegration and Integration	92
4.4.2.2	Error Correction Model	92
4.5	Empirical Results	94
4.6	The Issue of Interpolation	96
4.7	Conclusion and Policy Implications	97
Notes		100
Tables		101

CHAPTER 5 EXPORT GROWTH AND REAL EXCHANGE RATE VOLATILITY: A COINTEGRATED VAR APPROACH

5.1	Introduction	110
5.2	Determinants of Export Demand Function	113
5.3	Data	116
5.4	Methodology	116
5.4.1	Cointegrated VAR	116
5.4.2	Johansen's Cointegration Estimation	118
5.4.3	Impulse Response Function	119
5.4.4	Forecasting Error Variance Decomposition	119
5.4.5	Model Specification	120

5.5	Empirical Results	121
5.5.1	Aggregate Export Demand	121
5.5.1.1	Unit Root Tests	121
5.5.1.2	Johansen's Cointegration Analysis	121
5.5.1.3	Impulse Response Analysis	123
5.5.1.4	Forecast Error Variance Decomposition	125
5.5.2	Error Correction Model and Wu-Hausman Exogeneity Test	126
5.6	Estimation with Indonesia's Four Biggest Trading Partners	127
5.7	Concluding Remarks and Further Direction of Research	129
Notes		131
Tables		133
Figures		141

CHAPTER 6 EMPIRICAL STUDIES ON TRADE WEIGHTED EXCHANGE RATES

6.1	Introduction	144
6.1.1	Recent Literature Review	144
6.1.2	Contents in Brief	147
6.2	Modelling the Exchange Rate Behaviour	148
6.2.1	The Neutral Money Approach of PPP	148
6.2.2	The Law of One Price and the Arbitrage Approach of PPP	150
6.2.3	The Efficient Market Approach of PPP	151
6.3	Exchange Rate and Price in Indonesia	152
6.3.1	The Background	152
6.4	Construction of Exchange Rates and Prices	155
6.4.1	Introduction	155
6.4.2	Variables Construction	156
6.5	Integration and Cointegration	158
6.5.1	Introduction	158
6.5.2	Integration and Cointegration Tests	160
6.5.3	Empirical Results	165
6.5.4	The Dynamics of Adjustment (ECM Modelling)	167
6.5.5	Concluding Remarks	169
6.6	Testing Symmetry and Proportionality	169
6.6.1	Introduction	169
6.6.2	Testing Procedures	171
6.6.3	Empirical Results	171
6.7	Issues on Structural Break	172
6.7.1	Introduction	172
6.7.2	Structure Change in Mean	174
6.7.3	Empirical Results	176
6.7.4	Conclusion	177
6.8	Persistence and the Size of the Random Walk	177
6.8.1	The Background	177
6.8.2	Variance Ratio Test	179
6.8.3	Literature Review	180
6.8.4	Empirical Results	182
6.8.5	Conclusion	183
6.9	Concluding Remarks	183

Notes 186
Tables 188
Figures 206

CHAPTER 7 TRADE DEPENDENCE, COMMON TRENDS AND CURRENCY AREA

7.1 Introduction 218
7.2 Pattern of Regional Economic Growth 221
7.2.1 Characteristics of Economic Growth 221
7.2.2 Literature Survey on Open Regionalism 223
7.3 Construction of Real Export Exchange Rates 226
7.4 Trade Dependence and the Convergence of REER 227
7.4.1 Trade Dependence of Indonesia and the Main Trading Partners 227
7.4.2 Trade Dependence Indices 228
7.4.3 Cronbach's standardized coefficient alpha (α) and Pearson Correlation Coefficient 228
7.4.4 Conclusion 230
7.5 Common Stochastic Trends and the Basket of Real Export Exchange Rates 231
7.5.1 Common Trends and Systems of Bilateral Exchange Rates 231
7.5.2 The Concept of Generalized Purchasing Power Parity 233
7.5.3 The Methodology 234
7.5.4 Literature Survey on the Use of Common Trends 235
7.6 Empirical Results of the Common Currency Region 236
7.6.1 The Fluctuation of Real Export Exchange Rates 236
7.6.2 Unit Root Tests for Stationarity 237
7.6.3 Empirical Results and Application for the Common Exchange Rate Region 238
7.7 Concluding Remarks 241

Notes 244
Tables 246
Figures 262

CHAPTER 8 CONCLUSION 265

REFERENCES 272

TABLES

Table 1.1	Southeast Asian Economic Indicators, 1996-98	15
Table 1.2	Bank Restructuring in Indonesia	15
Table 1.3	Macroeconomic Projections	16
Table 2.1	Chronology of Economic and Financial Reforms in Indonesia Since 1983	28
Table 2.2	Indonesia's Major Macroeconomic Indicators, (Percentage Change, 1976-1992)	29
Table 3.1	Principal Import Barriers by SITC Section (1980)	65
Table 3.2	Trade and Investment Reforms	66
Table 3.3	A Summary of Trade Statistics	67
Table 3.4	Annual Growth of Manufacturing Value Added (MVA), (1975-1990)	69
Table 3.5	Exports, Imports and Revealed Comparative Advantage (RCA) Indices by Different Trade Group of Manufactures (Percentage)	70
Table 3.6	Approved New Foreign Investments by Sectoral Distribution (US millions), (1986-1991)	71
Table 3.7	Unit Root Tests	72
Table 3.8	Johansen Maximum Likelihood Cointegration Tests	73
Table 3.9	Dependent Variable: ΔY (1977Q3 - 1992Q4) 62 observations, Dynamic Forecasts: (1993Q1-1993Q4)	74
Table 3.10	Dependent Variable: ΔY (1977Q3 - 1992Q4) 62 observations, Dynamic Forecasts: (1993Q1-1993Q4)	75
Table 3.11	Alternative Tests for Non-Nested Regression Models	76
Table 3.12	Johansen Maximum Likelihood Cointegration Tests (Annual Data)	77
Table 3.13	Dependent Variable: ΔY (1978 - 1993) (Annual Data)	78
Table 3.14	Dependent Variable: ΔY (1978 - 1993) (Annual Data)	79
Table 3.15	Alternative Tests for Non-Nested Regression Models (Annual Data)	80
Table A3.1	Average Annual Growth Rates of GDP and Merchandise Export (Percent)	81
Table A3.2	Orientation of Trade Strategy, (1965-73 & 1973-84)	82
Table 4.1	A Summary of Empirical Studies on Export and Output Growth	101
Table 4.2	Unit Root Tests	103
Table 4.3	Johansen Maximum Likelihood Cointegration Tests	104
Table 4.4	Results from the Error-Correction Models	105
Table 4.5	Causality Test: Real Oil Export Growth Causes Real Output Growth	106
Table 4.6	Causality Test: Real Output Growth Causes Real Oil Export Growth	106
Table 4.7	Johansen Maximum Likelihood Cointegration Tests (Annual Data)	107
Table 4.8	Results from the Error-Correction Models (Annual Data)	108
Table 4.9	Causality Test: Real Oil Export Growth Causes Real Output Growth (Annual Data)	109
Table 4.10	Causality Test: Real Output Growth Causes Real Oil Export Growth (Annual Data)	109

Table 5.1	Augmented Dickey-Fuller Unit Root Tests	133
Table 5.2	Johansen Maximum Likelihood Cointegration Tests	133
Table 5.3	Normalized Cointegrated Vectors (β), Log Likelihood Tests of Restrictions	134
Table 5.4	Testing Contemporaneous Correlation of Off-Diagonal Error Variance Matrix	134
Table 5.5	Generalized Forecast Error Variance Decomposition for Exports	135
Table 5.6	Error Correction Model and Wu-Hausman Exogeneity Test	136
Table 5.7	Trace Statistic Tests (Country-by-Country	137
Table 5.8	Normalized Cointegrated Vectors (β), Log Likelihood Tests of Restrictions (Country-by-Country)	138
Table 5.9	Testing Contemporaneous Correlation of Off-Diagonal Error Variance Matrix (Country-by-Country)	138
Table 5.10	Generalized Forecast Error Variance Decomposition for Exports (Country by Country)	139
Table 5.11	Error Correction Vectors and Degree of Volatility	140

Table 6.1	A Summary of Surveys on the Validity of PPP Using Integration and Cointegration Techniques	189
Table 6.2	Unit Root Tests (Level)	192
Table 6.3	Unit Root Tests (First Difference)	193
Table 6.4	Cointegration Tests (DF, ADF & PP)	194
Table 6.5	Cointegration LR Test Based on Maximal Eigenvalue of the Stochastic Matrix	195
Table 6.6	Cointegration LR Test Based on Trace of the Stochastic Matrix	196
Table 6.7	Estimated Cointegrating Vector (β) and Adjustment matrix (α) (Normalized Values)	197
Table 6.8	Log-likeliood Ratio Statistic for Testing the Diagonality of the Error Covariance Matrix	197
Table 6.9	Estimation of Error Correction Models	198
Table 6.10	Testing Symmetry and Proportionality	199
Table 6.11	Descriptive Statistics of Effective Exchange Rates (1983Q2 as the Break)	200
Table 6.12	Descriptive Statistics of Effective Exchange Rates (1986Q3 as the Break)	200
Table 6.13	Perron Tests of the Unit Root Hypothesis of Structural Break at 1983:2 ($\lambda = 0.33$)	201
Table 6.14	Perron Tests of the Unit Root Hypothesis of Structural Break at 1986:3 ($\lambda = 0.53$)	202
Table 6.15	Summary Statistics for the Change of Nominal and Real Effective Exchange Rates (1978Q2 - 1993Q4) Sample Size: 63	203
Table 6.16	Variance Ratio Test on the Nominal Effective Exchange Rate (1978Q1 -1993Q4)	204
Table 6.17	Variance Ratio Test on Real Effective Exchange Rate (1978Q1 - 1993Q4)	205

Table 7.1	Institutional Initiatives for Economic Cooperation	246
Table 7.2	Sample Means of GDP Growth, Inflation, Investment/GDP and Export/GDP Ratios (1974 - 1991) (percentage)	247
Table 7.3	Standard Deviation of GDP Growth, Inflation, Investment/GDP and Export/GDP Ratios (1974 - 1991)	248
Table 7.4	Trade Dependence Indices of Indonesia and Her Main Trading Partners (percentage)	249

Table 7.5	Pearson Correlation Coefficients, (1975:1 - 1991:4)	250
Table 7.6	Cronbach's Standardised Coefficient Alpha, α	251
Table 7.7	Unit Root Tests of the Real Export Exchange Rate (Level)	252
Table 7.8	Unit Root Tests of the Real Export Exchange Rate (First Difference)	252
Table 7.9	Johansen's Trace Statistics of NIEs	253
Table 7.10	Johansen's Trace Statistics of ASEAN	254
Table 7.11	Johansen's Trace Statistics of NIEs and ASEAN	255
Table 7.12	Johansen's Trace Statistics of NIEs and Japan	256
Table 7.13	Johansen's Trace Statistics of ASEAN and Japan	257
Table 7.14	Johansen's Trace Statistics of NIEs, ASEAN and Japan	258
Table 7.15	Johansen's Trace Statistics of NIEs and US	259
Table 7.16	Johansen's Trace Statistics of ASEAN and US	260
Table 7.17	Johansen's Trace Statistics of NIEs, ASEAN and US	261

FIGURES

Figure 2.1	The Oil and Non-oil Exports	30
Figure 2.2	The Percentage of Oil and Non-oil Exports to GDP	30
Figure 2.3	The Imports	31
Figure 2.4	The Percentage of Total Exports and Imports to GDP	31
Figure 2.5	Annual GDP Growth	32
Figure 2.6	Inflation Rate	32
Figure 2.7	Rupiah-US Exchange Rates	33
Figure 2.8	Rupiah-Yen Exchange Rates	33
Figure 2.9	The Government Expenditure	34
Figure 2.10	The Percentage of Government Expenditure to GDP	34
Figure 2.11	The Direct Investment	35
Figure 2.12	The Percentage of Direct Investment to GDP	35
Figure 5.1	Generalized Impulse Response of Exports to One SE Shock in Volatility	141
Figure 5.2	Generalized Impulse Response of Exports to One SE Shock in Relative Prices	141
Figure 5.3	Generalized Impulse Response of Exports to One SE Shock in Foreign Income	141
Figure 5.4	Generalized Impulse Response of Exports to One SE Shock in Volatility (US)	142
Figure 5.5	Generalized Impulse Response of Exports to One SE Shock in Volatility (Japan)	142
Figure 5.6	Generalized Impulse Response of Exports to One SE Shock in Volatility (Singapore)	143
Figure 5.7	Generalized Impulse Response of Exports to One SE Shock in Volatility (Korea)	143
Figure 6.1	Changes in Nominal Effective Exchange Rate (DNAW) and Domestic Price (DIP)	206
Figure 6.2	Changes in Nominal Effective Exchange Rate (DNAW) and Effective Foreign Price (DPRA)	207
Figure 6.3	Changes in Domestic Price (DIP) and Effective Foreign Price (DPRA)	208
Figure 6.4	Ratio of Domestic Price (IP) to Effective Foreign Price (PRA)	209
Figure 6.5	Nominal Effective Exchange Rates (NAW, NGW)	210
Figure 6.6	Real Effective Exchange Rates (REA, REG)	211
Figure 6.7	Variance of k-differences (NAW)	212
Figure 6.8	Variance of k-differences (NGW)	213
Figure 6.9	Variance of k-differences (REA)	214
Figure 6.10	Variance of k-differences (REG)	215
Figure 6.11	Variance Ratio of Real Effective Exchange Rate (arithmetic approach)(REA)	216
Figure 6.12	Variance Ratio of Real Effective Exchange Rate (geometric approach)(REG)	217
Figure 7.1	Hong Kong Real Export Exchange Rate (log)	262
Figure 7.2	Korea Real Export Exchange Rate (log)	262
Figure 7.3	Malaysia Real Export Exchange Rate (log)	262
Figure 7.4	Philippines Real Export Exchange Rate (log)	262
Figure 7.5	Singapore Real Export Exchange Rate (log)	263
Figure 7.6	Thailand Real Export Exchange Rate (log)	263
Figure 7.7	Taiwan Real Export Exchange Rate (log)	263
Figure 7.8	Japan Real Export Exchange Rate (log)	263
Figure 7.9	US Real Export Exchange Rate (log)	264

ACKNOWLEDGEMENTS

Pursuing a degree of Doctor of Philosophy on a part-time basis is as daunting as climbing the Himalayas. Without the consistent and long-standing support of my teachers, friends and family in the past few years, I would not have the stamina to complete this dissertation by now.

I would like to first express my heart-felt thanks and appreciation to my supervisor Kate Phylaktis, Professor of International Finance and Head of Department of Banking and Finance, City University Business School, for her helpful comments on my dissertation all along. Her strict supervision and inspiring instructions always give me insights to polish my work to a high scholastic level, turning the mundane and tedious research work into a rewarding and fulfilling learning experience.

I would also like to take this opportunity to thank the examiners, Roy Batchelor, HSBC Professor of Banking and Finance of City University Business School and Eric Girardin, Professor of Economics of the Université de la Méditerranée Aix-Marseille II, for their comments and critics, which are most helpful for refining my dissertation.

I am also indebted to Dr. David Mole, Dr. K. W. Li and Dr. T. M. Ho of the City University of Hong Kong for providing me valuable advice every now and then.

Finally, a special thank-you should go to my wife Ivory for her patience and support throughout the past several years while I was struggling on my part-time study, without which I would not have been able to complete my study so smoothly.

ABSTRACT

The thesis studies the export growth, economic growth and real exchange rate in Indonesia. The research is a piece of empirical studies mainly covering the period from 1974 to 1993. Indonesia is an oil-exporting country. Economic recession with high inflation rate in the early eighties prompted the government to undertake a series of economic and financial reforms. It was believed that oil export earnings by itself could not sustain long-term economic growth. Trade reform and devaluation would stimulate high economic growth through diversifying non-oil exports, attracting foreign and domestic capital accumulation. The research presented is a contribution to the study of the linkage between export trade and economic growth on one hand, and export trade and real exchange rate on the other hand in Indonesia. In particular, five issues are examined: 1) The role of export growth in economic development. Export growth may boost a country's demand for output and hence cause higher economic growth. It may also increase economic efficiency through economies of scale and liberalization of exchange control; 2) The issue of export-growth can be extended to the argument of export-led growth hypothesis. The hypothesis states that the continuation of merchandise exports would lead to higher output growth. We examine the validity of the hypothesis in the context of the Indonesian export growth economy; 3) To investigate whether export growth is negatively related to real effective exchange rate volatility by the use of cointegrated VAR approach. Policies to minimize exchange rate volatility reduce unfavourable effects on the volume of exports; 4) Since real exchange rate is an important determinant of exports, its behaviour would be worth examining. We particularly examine whether it is stationary by looking at the theory of purchasing power parity. The non-rejection of the purchasing power parity hypothesis implies stationarity of the real exchange rate; 5) Finally, we examine whether the real exchange rate of Indonesia and that of its trading partners share a common trend. This will be an indication that they can form a common currency area. The idea is incorporated into the theory of generalized purchasing power parity. A common currency policy might therefore contribute to intra- and inter-regional trade in the region of Pacific Rim. Hence the research may shed more insight on economic development in one of the less developing countries.

Chapter 1 Introduction

1.1 Executive Summary

Asian developing countries have grown rapidly in the past 15 years. This rapid economic growth is not confined only to the four East Asian newly industrialized economies (NIEs), namely, Hong Kong, Singapore, Korea and Taiwan; others like Thailand, Malaysia, the Philippines and Indonesia have achieved sustainable real economic growth which was accompanied by a series of trade and economic reforms. The research presented below is a contribution to the study of the linkage between export trade and economic growth on one hand, and export trade and the real exchange rate on the other hand in Indonesia. In particular, we examine the following five issues:

First, we examine the role of export growth in economic development. Export growth may boost a country's demand for output and hence cause higher economic growth. It may also increase economic efficiency through economies of scale and liberalization of exchange control (Jung and Marshall, 1985). In this stance, two models are applied to examine the export-economic growth relationship.

Second, the issue of export-growth can be extended to the argument of export-led growth hypothesis. The hypothesis incorporates the causation effect of exports to economic growth. The hypothesis states that the continuation of merchandise exports would lead to higher output growth and is widely documented in recent literature (Ram 1985; Jung and Marshall, 1985; Bahmani-Oskooee & *et.al.*, 1991; and Sheehey, 1992). Evidence from the previous studies is mixed. We examine the validity of the hypothesis in the context of the Indonesian export growth economy.

Third, we consider whether export growth is negatively related to real effective exchange rate volatility. Policies to minimize exchange rate volatility reduce unfavourable effects on the volume of exports (Lastrapes and Koray, 1990; Engle 1983).

Fourth, since the real exchange rate is an important determinant of exports, its behaviour is worth examining. We particularly examine whether it is stationary by looking at the purchasing power parity. The non-rejection of the purchasing power parity hypothesis implies stationarity of the real exchange rate.

Finally, we examine whether the real exchange rate of Indonesia and that of its trading partners share a common trend. This will be an indication that they can form a common currency area. The original idea is proposed by Enders and Hurn (1994) in the theory of generalized purchasing power parity (GPPP). Even if the bilateral real exchange rates are generally non-stationary, they would be cointegrated in the long-run if their fundamental variables, i.e. the forcing variables, are highly interrelated. Since there exists similar pattern of trade liberalization and financial openness in the East Asian countries, it is unarguably to say that in a multi-country setting, a cointegrating vector found among the real exchange rates is considered as a feasible single currency area. A common currency policy might therefore contribute to intra- and inter-regional trade in the region of Pacific Rim.

1.2 Outline of the Texts

The thesis consists of 5 main chapters and the outline of each chapter is presented as follows:

After an overview on the Indonesian economic reforms, exchange rate policies and recent economic crisis mentioned in Chapter 2, Chapter 3 explains the role of export growth in economic performance. A relationship of real export and output growth is proposed by the export-led growth hypothesis. Bhagwati (1990), Greenaway and Nam (1988) and Krueger (1990) carefully define the terminology of export-promoting/export-led growth. It is argued that the general high domestic costs of import-substitution strategies have been substituted by the export-promoting strategies.

In the early eighties, the Indonesian government adopted the export-oriented industrial strategies. Trade statistics show that an export-promoting policy has substantially increased total values of the manufactured goods. Trade and investment reforms also attracted considerable foreign capital inflow and investment. Hence, real non-oil export was the basic explanatory variable in the export-growth hypothesis. Two export-growth models are investigated: the balance of payment constrained growth model (Thirlwall, 1980; Thirlwall and Dixon, 1994) and the neoclassical export-growth model (Feder, 1983). The chapter is to test the validity of the assumptions in the specification of export-growth and to measure the effects of the export growth to economic expansion.

The assumptions of balance-of-paymentconstrained growth model state that in the long run, a country's growth rate of real income is equal to the real income growth rate, which is consistent with current account balance. The growth model is tested by the Johansen's cointegration technique. The model is divided into sub-sample periods. The overall results, in general, are in favour of a long run relationship between real exports and real income in Indonesia. The simple policy conclusion is that if the governmentwish to grow faster they must first raise the balance-of-paymentsconstrainton demand. If the balance-of-paymentsequilibrium growth rate can be raised by making exports more attractive and by reducing the income elasticity of demand for imports, demand can be expanded without producing balance-of-payments difficulties. Hence the empirical evidence of the balance-of-payment constrained model is in support to the advocates of export-led growth.

An alternative to testing the export-growth synthesis is to include "unconventional variables" in the neoclassical production theory. The expanded model is to explain the magnitude of export-output growth, by including other explanatory variables of output growth such as I/Y, rate of government expenditure, labour force, non-exports, imports and the exchange rate. We use the general-to-specific approach as well as the non-nested regression test to decide on the export aggregates. The model also shows that real government expenditure growth, (ΔG), investment to income ratio (I/Y), labour force (ΔLAB), imports (ΔNOIM), and real exchange rate (ΔR) are important determinants of the size of output growth.

The above two models give an account of export-output growth for the Indonesian economy. Trade liberalization in the eighties fostered the growth in the non-export sector. The arguments are supported by Shepherd & *et. el.* (1998), as they prove that Indonesia experienced considerable increase in manufacturing output and productivity in the mid-1980. On the other hand, the issue of causation between non-oil exports and economic growth has not been examined in the previous studies. This issue is discussed in the next chapter.

Chapter 4 investigates the causal link between exports and growth in line with Indonesia's trade liberalization policy. We first divide real export sector into real non-oil and real oil export sectors. The main objective is to understand the direction of causation between the two export sectors and economic growth. The method of cointegration and three causality tests are employed to test the validity of export-led growth hypothesis.

In summary, a long-run cointegration relationship is found between non-oil real exports and economic growth. A bidirectional causation is found in those variables. The overall results imply that the bi-directional causality tests do not support the export-led growth theory, which emphasises the growth of export unidirectionally contributes to higher economic growth. On the other hand, it is the real oil export growth Granger-cause the real output growth (with quarterly data). The export-led growth, defined as a unidirectional causation from exports to output, is only valid in the Indonesia's oil export industry.

Where a country's policy emphasises export growth, one of the major issues is to ensure a stable exchange rate. If trade reforms require a supportive macroeconomic environment as suggested by Alam and Rajapatirana (1993), steady export growth should be enhanced by minimizing disturbances of macroeconomic variables. A negative relationship between export growth and real exchange rate volatility is well-documented in literature (Arize, 1995; Chowdhury, 1993; Grobar, 1993; Koray and Lastrapes, 1989; Lastrapes and Koray, 1990; Pozo, 1992). They all conclude that volatility of real exchange rate is detrimental to export growth. In the microeconomic aspect, firms that are highly sensitive to real exchange rate changes are most likely to be negatively affected by increases in real exchange rate uncertainty (Grobar, 1993, p.375). . Chapter 5 examines the effects of real exchange rate volatility on exports. As Binhadi (1994) argued Indonesia's devaluation policy in the eighties aimed to improve the country's export competitiveness and smooth export fluctuations by maintaining real exchange rate stability.

Two kinds of export demand functions are examined: an aggregate Indonesian export function and disaggregated, country-by-country export functions. The latter includes Indonesia's four biggest export-trading partners, namely, the US, Japan, Singapore and Korea. Export demand is modelled as a function of real exchange rate volatility, relative export prices and foreign income. Real exchange rate volatility is used as a proxy for real exchange rate uncertainty and is weighted by the moving average technique. Following Lütkepohl and Reimers' (1992) cointegrated VAR method, impulse response function and forecasting error variance decomposition techniques are used to analyze the multi-cointegrated vectors. The empirical studies conclude that real exchange rate volatility exhibits a negative relationship with Indonesia's export trade. Volatility provides a strong evidence for export uncertainty. If the export promotion strategy is pursued, export uncertainty will certainly hinder economic growth and development. With increasing export growth among regional trading partners, Indonesian government should carefully protect export trade by minimizing real exchange rate disturbances. Further research on the means to reduce exchange rate volatility will help to support a policy of export-led growth.

Chapter 6 extensively discusses the nature of real exchange rate movements. Exchange rate stability is crucial to a country's economic growth and trade. This is especially true for developing countries like Indonesia to pursue export-oriented policies. Substantial fluctuation of exchange rate can lead to unfavourable economic consequences. One of the effects is restraining the regular operation of the financial system (Engel and Hakkio, 1993). Indonesia implemented two devaluations in the last decade, which were accompanied by a series of financial and trade reforms. The primary objectives were to increase export competitiveness and to sustain economic growth. On the other hand, devaluations might cause domestic inflation. Fischer (1989) argues that the role of exchange rate in inflation is critical. Since exchange rate changes may be linked with general price changes, it is possible to model exchange rate movement in the form of PPP. Following the approach of Black (1976) and Crockett and Nsouli (1977), six trade-weighted effective exchange rate indices are constructed. Using multivariate cointegration techniques, the studies find evidence in favour of long run PPP, regardless of any *a priori* restriction in the equations. The outcomes of the tests, however, are not sensitive to the choice of weighted average techniques in constructing the effective exchange rates.

In order to get a comprehensive picture of exchange rate movements, three hypothesis are tested, namely, 1) symmetry and proportionality (White, 1980; Johansen and Juselius, 1992; Liu and Maddala, 1992); 2) structural breaks (Perron, 1990); and 3) variance ratio tests on persistence of the random walk (Cochrane, 1988). It is concluded that the hypothesis of symmetry and proportionality is not rejected in the unrestricted and restricted real exchange rate equations. The result not only validates the stationarity of real exchange rate, but it also implies the long run proportionality of PPP.

We tested PPP hypothesis indirectly by investigating whether current shocks have permanent effects on the real exchange rate. Perron (1989) argues that most macroeconomic time series are not characterized by the presence of a unit root and that fluctuations are indeed stationary. By allowing a one time, single change in the intercept and/or the slope, the series will be stationary around the deterministic trend. This means that the break acts as a buffer by removing the influence of the shocks from the noise function. Following Perron's break-point statistical procedure, the unit root hypothesis of nominal and real effective exchange rate series cannot be rejected. This means that stochastic effects are strong in the series. For this purpose, another test is performed, namely, Cochrane's (1988) variance ratio test, to investigate the random walk persistence of the exchange rate series. It is shown that the influence of the random walk component is strong in the earlier lags, ranging from 8 to 17 quarters to half the size of the series, and the effect is less significant when compared with some developed countries.

On the whole, Chapter 6 reviews the statistical properties of trade-weighted real effective exchange rates in the form of PPP hypothesis. Generally, the results are in favour of PPP in Indonesia. On the other hand, it is true that nominal exchange rate series are non-stationary, driven by a random walk component that is very persistent. As the Indonesian government implemented financial and trade reforms in the mid-eighties, devaluation-cum-monetary policies were introduced to reduce shocks from exchange rate fluctuation. Therefore, it is necessary to create better environment to facilitate foreign investment as well as to encourage export-led economic growth. The price of the

Rupiah becomes very sensitive to the changes of major currencies. A prudent exchange rate policy minimizes the effects from shocks and keeps exchange rates and prices from drifting apart.

If a stable nominal exchange rate contributes to export growth, a linked stable exchange rate mechanism can foster intra-regional trade and build up mutual export-trade relationships. The general reduction in trade barrier and the removal of capital flow restrictions have resulted in highly integrated trade and financial flows in the international market. Persistent trade imbalances and fluctuation of exchange rates may cause the possibility of exchange rate policy coordination among trading partners. Williamson (1978) argues that variation in real exchange rates forces costly industry shut-downs and start-ups that could have been avoided by greater exchange rate stability. Kenen (1987) also states that exchange rate exhibits less variability in the coordinated solution (mutual moneetary policy) than it does in the uncoordinated equilibrium (independent monetary policy). Higher trade dependence would link to mutual exchange rate adjustments, leading to lesser exchange rate variability and fostering export growth.

Chapter 7 therefore firstly notes the trade dependence between Indonesia and its regional trading partners. The role of a possible common currency is explored to reduce exchange rate volatility in the region. The presumption is that the Asia-Pacific region has generally experienced high economic growth in the past ten to twenty years. The region's economies shared similar goals and objectives in promoting export trade, controlling inflation, attracting foreign direct investment and targeting exchange rate movement. The introduction of open regionalism may therefore foster regional trade as well as economic growth (Goto and Hamada, 1994; Green, 1994; Balassa and Noland, 1994; Suh, 1994). A common currency in an open trade area can mitigate external shocks both in the short run and long run.

Chapter 7 is divided into two parts. The first part presents the calculation of Trade Dependence Index and Cronbach's standardized coefficient alpha. The former measures the relative trading strength of Indonesia and its trading partners, whilst the latter calibrates the degree of trading convergence among regional trading groups. The results show that Singapore and the United States are Indonesia's main trading partners. Moreover, statistical results confirm that there is strong real exchange rate convergence among economic groups, such as NIEs (Hong Kong, Singapore, Taiwan and South Korea) and the ASEAN (Malaysia, Singapore, Thailand and the Philippines), and Indonesia. Foreign trade with Indonesia has regionally increased.

The second part is to estimate a system of bilateral real export exchange rates on the basis of generalized purchasing power parity (GPPP). Enders and Hurn (1994) developed the basic thought behind GPPP. The rationale underlying this is as follows: First, the real fundamental macroeconomic variables affecting the determination of real exchange rate are themselves non-stationary. It is found that the movements of real export-exchange rate among Indonesia's trading partners are non-stationary. Second, in a well-defined currency area, the driving force of real fundamentals will interact and real exchange rates share a reduced number of common trends. If a region is economically integrated and exposed to an export-promotion environment, their real-export exchange rates will be linked together. An integrated economic region will display a co-movement of real exchange rates in the long run.

Countries are grouped on the basis of economic and political factors. The result shows that there is strong evidence for the presence of cointegrated vectors. The common stochastic trends are shared by different economic and political groupings. The cointegrated vectors have heavy factor loadings in Singapore and the influence of Singapore in the region is significant. Moreover, the empirical results also indicate the relevance for the economic influence of Japan and the US in the Asia-Pacific region. The economic interests of these two countries in the region are very crucial. In response to the presence of common stochastic trends, the Indonesian government should strengthen regional economic coordination with those of the ASEAN and APEC members in order to implement common exchange rate policies. Exchange rate stabilization therefore provides an excellent environment for promoting export growth within the region.

1.3 Recent Economic Crisis

The recent economic and financial crisis in 1997-1998 gave a huge economic blow to Indonesian economy with tremendous amount of uncertainties. Before the economic crisis, Indonesia enjoyed ten to fifteen years of economic expansion with an average of 6-7 percent economic growth per annum. The main macroeconomic indicators, such as economic growth, inflation and export growth *etc.*, were strong and Indonesia was seen as the most promising country in the region (Eklöf, 1999). The sound economic achievement was also commended by Professor Jeffrey Sachs of Harvard University in the World Economic Forum in 1996 that, Indonesia was ranked fifteenth of the world economic competitiveness. Hill (1997) also asserted that Indonesia was one of the most remarkable development success stories in the last third of the 20th century.

Even though the Asian economic crisis did not swallow Indonesia's economic success overnight, the contagious effect originated from the collapse of Thai baht in the early 1997 was eventually transmitted to the Asian economies. The growth of Indonesian economy was forced to a halt[1].

The fiasco of the Indonesian economy in the 1997-98 was unfortunately coupled with political instability and social discontent. Doubts about the health of President Suharto, street riots of university students demanding democratic changes, anti-Chinese protests and the spectres of food shortages all caused the total eclipse of confidence to every walk of the Indonesian, to both domestic and international business sectors.

The "loss of confidence" was well summarised at the early stage of the crisis whilst the rupiah fell drastically against per US dollar. Investors expected that the steady depreciation of the rupiah by around five percent per year which had taken place since 1996 would no longer hold (Suryahadi, 1999). A huge demand for US dollars by wealthy Indonesian, especially the ethnic Chinese[2] who usually own business, by foreign investors and by those with unhedged foreign exchange denominated debt[3]. The flight of capital accelerated in the first quarter of 1998 only worsened the value of rupiah. A sharp depreciation of rupiah vis-à-vis US dollar was resulted. According to IMF statistics, the rupiah/US nominal exchange rate was Rp2403.27/US at the first quarter of 1997 and was fallen to Rp10460.77/US at the second quarter of 1998. The depreciation rate was 335% against per US dollar.

The consequences of exchange rate depreciation were in two folds. First, the shape depreciation inevitably caused high domestic inflation rate. As Indonesia was a small open economy, importers had to pay higher costs for the importables, which were in line to the world market prices. The general prices would be spiralled by the import-inflation effect on the domestic economy. For the exportables, exporters preferred exporting to selling goods domestically, as long as price differential remains. The reduction of domestic supply further induced higher domestic prices. Table 1.1 shows GDP growth and inflation of the Southeast Asian countries hit by the crisis. Indonesia's inflation rate in 1998 was 75% and was recorded the highest among those badly hit economies. The continuing depreciation of the rupiah might have resulted in persistently high rates of inflation (Soesatro and Basri, 1998). Second, firms were insolvent especially those could no longer afford to service their dollar-denominated debts. Estimations of the value of total corporate sector foreign debt ranged from 45 billion dollars to 140 billion dollars, or between 40 and 120 percent of Indonesia's GDP in 1997 (Eklöf, 1999). To make things worse, in less than ten years the private sector, corporate and banking, had totally borrowed some US$80 billion which were mostly unhedged and unsecured (Arndt and Hill, 1999).

Firms' insolvency was partly due to the currency and maturity mismatches of the banks. According to Wong (1999), the bank often extended loans without adequately assessing credit risks. Many Indonesian banks were poorly managed and had a high ratio of non-performing loans (Johnson, 1998). Currency crisis simply acted as a catalyst for financial and banking crisis in Indonesia. The combination of exchange rate depreciation, high inflation rate, firms' insolvency and mismanagement of banking system meant that the total output, in terms of real GDP fell. Table 1.1 justifies the fact that Indonesian economy was severely hit by negative real GDP growth. A -15% GDP growth was recorded in 1998. Other severely hit economies such as Malaysia and Thailand, only -5.8% and -8% were recorded respectively. Indonesia's growth rate represented the worst economic performance among the Southeast Asian countries. The economic downturn was matched by increasing unemployment and poverty rates (Booth, 1999).

1.4 Aftermath

As Evans (1998) comments, Indonesia's period of transition should last until the end of 1999. Provided this process does not end up with the country retreating from reform, the process of economic and financial transformation should be underway. The economic condition in 1999 was filled with significant progress. One of the main tasks was to reform the banking system. *Bank Indonesia,* the Indonesian Central bank, played a substantial role in stabilising the economy. Table 1.2 shows the restructuring of the *Bank* in Indonesia. The main objectives were to restore the public and international confidence. The operation of the *Bank* has to in line with prudent fiscal policy and be consistent with sound macroeconomic policy. After the economic upheaval in 1998, economic condition, in general, was recovered with low inflation and strengthening rupiah exchange rate.

Table 1.3 indicates some macroeconomic projections. Inflation was tightly controlled and was kept down to 4.0-5.0% in 1999/2000. The same percentage will also be forecasted in 2000/2001. The curb of inflation was in line with the control of base money. The tight monetary policy indeed significantly contributed to the domestic price stability. Meanwhile, the strengthening of rupiah against US dollar also helped to stable general price level. Up to the end of 1999, rupiah exchange rate was appreciated to Rp7,050 per US dollar from Rp8,000 per US dollar in the end of 1998 (Table 1.3). "The achievement of the monetary policy to limit liquidity excess in the public was an important factor to decrease speculative activities in order to accelerate the strengthening of the exchange rate. Positive market expectation accompanied by relatively improved political situation within the country, better economic prospect and achievement in restoring public's confidence on the banking were other important factors that accelerated the rupiah strengthening" (Bank Indonesia, 2000).

The export and import sectors began to rise in value after 1998. The growth of exports is supported by the increase demand in trading partners and by the stable exchange rate. The current account on the whole is positive but increases at decreasing rate, e.g. from $4.3 billion in 1998/1999 to a projected $1.8 billion in 2000/2001. The strong import growth can be partly explained by the domestic and public consumption. External debt was reduced sharply to 84.7% of GDP in 1999/2000 and will be further down to 75.2% (projected) in 2000/2001. The reduction is mainly due to better debt management of the banking system[4].

The economic crisis provided lessons for the Indonesian government to impose prudent financial -cum- economic policies. Whilst the economy may need to take 5 to 10 years for recovery, the government should have strong commitment to restructure the banking system as well as to continually pursue export-growth. The economic recovery of Indonesia, compared with other severely hit economies, say, Malaysia and Thailand, was much slowly growing. The easiness to extend credit and the taking of more risky projects by the private banks due to severe competition was partly shamed for the speedy financial liberalization in the early 1990. The moral hazard on bankers, poor management and insufficient banking regulations caused large amount of corporate debts. The crony capitalism and the weak financial structure triggered a contagious process of financial panic. The aim for financial restructuring was therefore to fasten the speed of restructuring the backing sector and to resolve huge corporate debts.

An effort had to be made to increase confidence and that led to the introduction of IMF policy package in 1997. It originally dealt with insolvent and weak banks and strengthened financial infrastructure. The programme was summarised into three areas (Djiwandono, 2000):

1) To establish a strong macroeconomic framework with prudent fiscal and monetary measures, in line with cutting government spending and tight monetary control;
2) To layout a comprehensive strategy to restructure the financial sector, including early closure of insolvent banks; and
3) To make a broad range of structural measures to improve governance in the government and the corporate sector.

This will be a compromise for long-term financial sector development. Even though the development of Indonesia's financial sector is not the scope of the thesis' investigation, it provides a cornerstone for understanding the workflow of financial intermediations, market reactions, and policy responses towards a stable and growing economy. The past twenty years of promoting export growth, the attraction of foreign investment and a stable exchange rate environment were fundamental to substantial economic growth in the future. The thesis of evaluating the past economic experience justifies this claim.

Notes

1. The origin, causes and consequences of the Indonesian economic crisis may refer to Arndt & Hill, (1999); Booth, (1999); Eklöf, (1999); Forrester, (1999) and Soesastro & Basri, (1998). For a broader understanding of the Asian crisis, see Corsetti & *et. al.* (1998a, 1998b); IMF Staff, (1998); Jomo, (1998); Montes, (1998) and Wong (1999).

2. The anti-Chinese protests had caused mass evacuations among the expatriate and Chinese communities in 1998.

3. The panic investors who had unhedged short-term private foreign debt suddenly realised that they were exposed to foreign exchange risk, making an enormous demand for US dollars that led to a substantial depreciation of rupiah.

4. The solutions of debt may be in terms of 1) debt restructuring; 2) collateral takeover; 3) loan sale and 4) go to court, see Joyosumaro, (2000).

Table 1.1 Southeast Asian Economic Indicators, 1996-98

	Indonesia	Malaysia	Philippines	Singapore	Thailand	Vietnam
GDP Growth						
1996	8	8.6	5.5	6.9	5.5	9.4
1997	4.7	8	5.1	7.8	-0.4	9
1998	-15	-5.8	-0.2	-0.2	-8	7
Inflation						
1996	6.5	3.5	8.4	1.4	5.8	4.5
1997	11.6	2.6	5.1	2	5.6	4
1998	75	5	8	2	8	5

Arndt and Hill, (1999), p.6

Table 1.2 Bank Restructuring in Indonesia

Criteria for Bank Restructuring
1. Least cost operation, with burden sharing of government and private sectors
2. In line with prudent fiscal policy
3. Restore the government responsibilities and avoid moral hazard on bankers
4. Consistent with sound macroeconomic policy

Good Governance in Banking
1. Human resources in the first line of defense in banking
2. All bankers should fulfill the fit and proper test
3. Candidate for bank managers take the interview test
4. Cooperation with police and attorney to exercise penalty on banking crime
5. Prudential regulation based on international standard
6. Emphasis more on supervisory rather than regulatory authority
7. Inspection on bank at least once a year
8. Bank examination equipped with investigation team
9. Mandatory for banks to have a complicance director
10. Extensive training for bank supervisor/inspector
11. The opportunity to hire public accountants for bank inspection

Joyosumaro, (2000)

Table 1.3 Macroeconomic Projections

	1998/1999	1999/2000	2000/2001
Macroeconomic Variables (% change)			
Real GDP growth	15.3	1.5-2.5	2.0-3.0
Inflation	75.0	4.0-5.0	4.0-5.0
Fiscal Variables (% of GDP)			
Overall balance	-2.0	-5.8	-4.5
Domestic financing	-2.3	2.7	2.5
External financing	4.3	3.1	2.0
External Variables ($ billion)			
Current account	4.3	2.5	1.5
Exports	48.3	53.2	57.2
Imports	-33.7	-37.4	-41.4
Services	-10.3	-13.3	-14.3
Other Variables (% of GDP)			
Current account deficit	3.9	1.5	0.8
External debt	126.8	84.7	75.2
Exchange Rate (Rp/US)			
	8,000	7,050	6,500

Booth, (1999); Bank Indonesia, (2000)

Chapter 2 The Background: Trade and Investment Reforms and Exchange Rate Policies in Indonesia

2.1 The Background

Economic and financial restructuring were significantly developed in Indonesia from 1980. As an oil exporting country, Indonesia's dependence on oil exports led to unfavourable effects in the period of economic recession, especially in the early eighties. Under the leadership of Soeharto government, a series of the Five-Year Development Plans, *Repelita,* had been implemented since 1969. The Development Plans, in general, emphasized domestic economic stability and growth, employment opportunities and foreign investment attraction. The oil shock in the seventies drastically increased oil prices. The country accumulated substantial foreign exchange earnings. The response of the oil windfall was to increase government spending on national projects and developments. These projects and programmes facilitated economic development in all sectors. Together with favourable terms of trade in the non-oil sector, Indonesia yielded a significant increase in international reserves (Gelb and Glassburner 1988). However, the oil boom was also associated with government protectionist and interventionist policies. Foreign direct investment was restricted. Trade and industrial policies were centrally controlled. Tariffs and other quantitative measures were to be used to restrict foreign imports. The protection incurred high administrative and production costs in the non-oil sectors. The so-called "Dutch Disease" suppressed the development of the non-oil sector (see Corden and Neary, 1982; Corden 1984b).

The decline of oil prices in the early eighties caused economic depression. Indonesia's net oil exports receipts were reduced by about 40% between 1980 and 1983. The deterioration of terms of trade led to substantial current account deficit, slow GDP growth and a sharp decline in exchange earnings.

The economic environment has driven the government to consider economic and financial restructuring. Changes of economic and financial reforms have been promulgated in 1983. The objectives were to "dynamize what is still a quite highly regulated economy with particular emphasis on promoting a more outward trade orientation and reducing the country's traditional reliance on primary commodity exports." (Sjahrir and Brown, 1992).

2.2 Trade and Investment Reforms

Indonesia's strong economic performance has been mirrored by a series of market-oriented reform programmes. More than a dozen major policy reform packages were introduced since 1983 (Sjahrir and Brown, 1992). Different authors characterize the division of each reform period. Freris (1990) states that the early 1980s reforms aimed at deregulating and liberalizing Indonesia's financial and international trade sectors. Sjahrir and Brown (1992) consider that the importance of the 1986 and 1988 reform packages were very strategic: the 1986 reform was targeted at trade whilst the 1988 reform at finance.

2.2.1 Chronology of the Trade and Investment Reforms

Table 2.1 gives the summary of economic reforms since 1983. Liberalization was implemented for several reasons: to increase competitiveness and efficiency in the banking and financial sector, to mobilize domestic savings to investors, to reverse the import-substitution to export-oriented growth policies, to change the trade regime by reducing tariffs and non-tariff barriers, and to emphasize the role of market-oriented mechanism through better resource allocation. The reform packages led to production diversification and reduced the dependence on oil-related industries. Table 2.1 divides the main trade and exchange rate reforms into two parts: 1) trade and investment; 2) exchange rate and exchange control.

Table 2.1 shows 23 items of trade and investment reforms from 1985 to 1990. The change of industrial policy began from the 1980s following the decline of the oil price. The deterioration of terms of trade and debt service forced the government to initiate trade and investment adjustments. As noted in the Table, the main changes included the reduction of tariff and non-tariff barriers, removal of import monopolies, abolition of export licences, increasing the ownership of foreign firms and the liberalization of rules concerning joint ventures. Deregulation provided solid foundation for the growth of export-oriented industries and the direct foreign investment in the economy.

2.2.2 Impacts of Trade and Investment Reforms to Export Growth

The trade and investment reforms have led to fundamental structural changes in different sectors that contributed to GDP growth. Indonesia witnessed a substantial growth in the manufactured exports. The economic dependence of oil exports has already switched to non-oil, manufactured-related exports. The share of oil exports out of total exports declined from 82% in 1981/82 to 40% in 1989/90, while the contribution of non-oil revenues to total domestic revenues increased from 29.4% in 1981/82 to 61% in 1989/90 (Anwar *& et.el.*, 1991). The quantum index of exports increased from 127.2 in 1980 to 155.4 in 1990, despite a severe decline in petroleum exports. (ADB, 1994). Moreover, tariff ceiling was reduced from 225% to 60% in 1985. The import reforms epitomised a drastic shift on tariff management. The average tariff has been around 20% and quantitative restrictions have covered about 10% of import items (World Bank, 1994). Table 2.2 shows some major macroeconomic indicators of the Indonesian economy. The rate of exports has a steady two-digit growth after 1986. On the other hand, the rate of crude oil exports growth declined annually and this implied that there was a higher proportional growth in the export-oriented manufacturing sector.

Trade reform and deregulation also attracted investment from the Asian countries to Indonesia. Equity financing provides considerable capital flows between the host and the domestic market (Langhammer, 1988). Foreign direct investment transfers technology and skill, which complements with Indonesia's rich resource- and labour-oriented activities. Thee (1991) reports that Asian NIC investments are on the whole more export-oriented than those of other countries. Korean and Taiwanese involve more share of investment/projects than the Hong Kong and Singapore investors. The surge of investment in the economy has made positive effects on allocation efficiency. Thee (1991) argues that the form of foreign direct investment has been complemented to Indonesia's strong comparative advantage - with those of labour intensive, standardized products and relatively simple and processing technologies.

Hughes (1995) says that trade among the Asian countries has grown for complementarity, initially in the exchange of raw materials for manufactures. The transfer of high level technology not only provides more employment opportunities, but also accelerates the depreciation of equipment and the purchases of new technologies (p.92). Hill (1990a) also states that the transformation of Indonesia's industries will contribute to rapid output and employment growth, increase productivity and wage growth by inclining into capital and skill-intensive industries. Therefore, trade reforms and deregulation give new and fresh momentum for further industrialization, higher economic growth and less dependence on oil-export earnings.

2.3 Exchange Rate Policies and the Economic Adjustments

Indonesia is one of the few petroleum exporting countries in East Asia. Economic development has been closely related to the volume of petroleum exported as it generated considerable foreign exchange earnings and government revenue. However, the instability of international petroleum price means that both oil earnings and government revenue are quite unpredictable. Therefore, the price instability directly affects the short-term macroeconomic adjustment in this small open economy. As international petroleum price rose in the early 1970s, considerable foreign exchange earnings led to real exchange rate appreciation. The appreciation increased the demand for importables and reduced the demand for exportables. Therefore trade balance declined and the current account was in deficit. The real exchange rate appreciation also implies the deviation of purchasing power parity (PPP) from its long run equilibrium level. PPP states that the purchasing power of the commodities between two countries will be the same as the value of the domestic currency is equivalent to the foreign currency multiplied by the bilateral nominal exchange rate.

Because of the conceptual difference between tradable and non-tradable goods, real exchange rate appreciation will increase the price ratio of non-tradable and tradable goods. Domestic residents demanded more imported goods as well as non-tradables. The increase demand for non-tradables raised the general price level and more resources were reallocated for producing non-tradables in the domestic market. The development of the non-oil sector was therefore adversely affected. The fast growth of the oil sector at the expense of the non-oil sector caused the production decline of the latter. This is the typical "Dutch Disease" phenomenon.

In order to reduce the adverse effects on the production of the non-oil sector, the rupiah was devaluated in 1978, 1983 and 1986. Devaluation ensured exchange rate protection of the non-oil sector and the reversion of the current account deficit.

2.3.1 Two Major Devaluations in 1980s

2.3.1.1 The 1983 Devaluation

The oil price had been tripled after 1978, however, evidence showed that there was sharp decline in both non-oil exports and imports. The terms of trade for primary products deteriorated. The current account once had two successive years surplus in 1978-1980, but fell into deficit of $6,338 million US dollars at the end of 1983. The trade imbalance induced capital outflow and further lost in international reserve. In order to improve the current account and stop capital flight, devaluation was implemented. The exchange rate was devalued in March to Rp970 from Rp1347 *vis-a-vis* US dollars. A major deregulation process accompanied the 1983 devaluation. Deregulation was necessary not only to diversify resources from the oil sector, but also to encourage the efficient utilization of resources (Hobohm, 1987). The situations worsened that the government had to take an active role to increase the efficient utilization of resources in both the internal and external sectors.

2.3.1.2 The 1986 Devaluation

The sharp decline in the price of oil caused the devaluation in September 1986. As Anwar *et. al.* (1991) state "the government has since adopted an active exchange rate policy of maintaining the competitiveness of the real effective exchange rate by controlling for inflation as well as depreciating the Rupiah gradually, and this was an important factor in increasing non-oil exports". Trade liberalization and investment opportunities further reduced the protection systems bias for exports. In 1986, 95%

foreign ownership was possible for export oriented investment. Moreover, innovative and substantive reforms were undertaken in financial sector. Deregulation processes were gone through the banking, insurance, stock and capital markets. The devaluation-cum-reformingpolicies achieved positive results: increasing government revenues, better efficient utilization of resources, higher domestic saving and investment, eliminating macroeconomic imbalances, more foreign and offshore investment, employment absorption and higher national income growth. Therefore, the devaluation-cum-economic policies actually revitalized the economy and contributed to export-oriented trade growth. Without the combination of other monetary and fiscal policies, mobilization of domestic resources is difficult to succeed.

2.4 Some Stylised Facts

In this section, graphs are presented in showing some "stylised facts" of the main macroeconomic indicators in Indonesia. In facing with world oil price decline in mid-1980s, the Indonesian government initiated a series of trade and investment reforms (as shown in Table 2.1) aiming at lessening the dependence of oil revenue. Trade reform packages were introduced in May 1986 which earmarked the institutional change in Indonesia. The liberalization was remarkably shifted towards a pattern of export-oriented industrialization. This has been done by a progressive dismantling of existing protection measures, such as non-tariff barriers. Figure 2.1 shows the oil and non-oil exports from 1973 to 1993. The oil export was traditionally the engine for sustainable economic growth and stable government revenue. The income from oil export was always higher than the non-oil export before a series of reform packages initiated in May 1986. The institutional changes in trade and investment promoted exports and gradually became the primary engine of industrial and economic growth. The income generated from non-oil exports was first time surpassed the income of oil export in 1987. The income growth of non-oil exports was on average 31.9% between 1987 and 1993, compared to only 12.2% income growth of oil-export of the same period. Figure 2.2 shows the percentage of oil and non-oil exports to GDP. The share of oil export to GDP was about 15-20% of GDP before 1987. During the oil boom (1973-1981), the oil export contributed the biggest share. The economy went into recession from 1982 to 1986 and the overall trend of oil export declined gradually. On the other hand, the percentage of non-oil export remained at 6-9% to GDP before trade reform. The share became significant and increased substantially as trade and investment packages promulgated after 1987.

The import growth was quite steady (Figure 2.3) and increased at increasing rate especially after the trade reform. There were two factors contributed to the growth: 1) Trade liberalization sharply reduced the amount of tariff rates, lessened non-tariff barriers and other trade restrictions and quota. Those measures reduced imported costs and demand for the importables, both finished and intermediate products, was greatly increased; 2) Higher demand for imported materials was the resultant of export-oriented industrialization. There might have a positive correlation between higher exports and higher imports, provided that the imported and exported goods are complementary. Figure 2.4 shows both total exports and imports share to GDP. The total exports are the sum of oil and non-oil exports. On the whole, the trade balance was positive and both variables increased their shares to GDP after the reform.

The annual GDP growth rate is shown in Figure 2.5. The fluctuation of GDP growth was higher between 1973 and 1981. The period was described as the oil boom whereas the annual growth rate was primarily determined by the oil export. The oil boom generated considerable income. Recession from 1983 to 1995 indicated a fall in GDP growth. Currency depreciation-cum-trade reform from 1986 and 1987 witnessed an upward trend of GDP growth. One of the characteristics in this period was that whilst the non-oil export growth dominated the oil-export growth, a more stable GDP growth was achieved by switching the trade policy towards export promotion. Dependence on oil revenue was the main reason for the fluctuation of GDP growth, as the oil price was sensitive to the world demand for oil production.

Inflation was much higher in the early 1970s than the rest of the years the data indicated (Figure 2.6). The rice crisis in 1972 saw the retail price doubled that caused a sharp rising inflation in 1973. According to Hill (1996), an accommodating monetary policy and rising international inflation (world oil crisis in 1973) – combined with the fixed exchange rate- were the underlying causes. Inflation accelerated further in 1973 in response to the quadrupling of oil prices, which led to an enormous increase in government revenue and exports. An anti-inflationary package was introduced in 1974 and inflation rate was then under control with an exception in 1978 to 1980. Devaluation of rupiah by 50% in 1978 was the cause to push the price up. The two devaluations in 1983 and 1986 also led to increase in inflation rate.

There were three times of devaluation indicated in the sample period: November 1978; March 1983 and September 1986. The rates of devaluation were recorded as 50%, 28% and 31% against US dollar respectively. The major reason for currency devaluation in 1973 was to increase non-oil exports that had been squeezed by the real appreciation of exchange rate (Figure 2.7). However, the policy was clashed with Iran-Iraq war twelve months later, which led to new round of pushing up world oil prices. The exchange rate management was more effective in the 1980s. Two devaluations were accompanied with tight monetary and fiscal policies. The growth of money supply was keep at a low level and fiscal policy was austere over that period of time. The 1986 devaluation was to maintain a constant real effective exchange rate, which aimed at 5% depreciation against the dollar per annum. Figure 2.7 confirms the stable growth of real exchange rate after 1987. Devaluations in the 1980s also affected nominal and real exchange rates against the yen (Figure 2.8). Japan was Indonesia's major exporting country in Asia. Compared to Figure 2.7, the depreciation rate against the yen was sharper than the dollar. The benefits to Indonesia were in twofolds: 1) substantial increase in export trade with Japan as the imported costs for Indonesia's primary and semi-finished products were comparatively lower – that made Japan a very important trading partner with Indonesia; 2) attraction of Japanese investment in Indonesia's manufacturing industries.

Government expenditure commonly shared a significant part of its role in Indonesia. Policies for economic growth were usually initiated by the government sector. The government had a powerful regulatory role in the economy and the large companies were usually state-owned. One of the examples was the state-owned oil company, Pertamina. The oil boom in the 1970s definitely increased the size of government revenue as well as expenditure. The real expenditure was more than doubled in 1971-1975 and rose about 60% from 1978 to 1980 (Figure 2.9). If the year 1987 is used as a watershed for trade reform, the annual government expenditure growth was 10.5% during the vigorous economic growth in the late 1980, compared with 20.4% per annual growth between 1973 to 1986. Figure 2.10 confirms that the share of government expenditure to GDP actually fell after 1987. Economic growth after trade and investment reforms was contributed by the expansion of private sectors. With the attraction of direct investment and liberalisation of trade, private firms were established for manufacturing production. Much greater emphasis was given to the development of internationally competitive export-oriented industries (UNIDO, 1993). The domination of non-oil exports, reduction of government protectionist measures and expansions for private sector in manufacturing production, all were characterized for the economic growth in the late 1980.

The direct investment to the share of economic growth was minimal before the trade and investment reforms in 1987 (Figure 2.11). The gross direct investment covers investment from aboard (credit), net of disinvestment (debit), and direct investment enterprises operating in Indonesia. The increase in direct investment was encouraged by a series of deregulatory reform packages, namely, liberalization of rules about joint ventures, reduction in the number of licences required for investment activities, and allowing distribution of own products domestically by joint ventured companies, *etc.*. Moreover, the liberalization of banking system also attracted capital flows both from private and foreign direct investments. Statistics confirms that there was 17.7% per annual growth for direct investment between 1976 and 1986, compared with 45.8% annual growth from 1987 to 1993. Figure 2.12 shows that there was a rapid capital inflow from 1987. The share of direct investment to GDP was up to 1.3% in 1992. Nevertheless, the direct investment-GDP share of Indonesia was still behind its neighbouring countries such as Thailand and Singapore.

2.5 Conclusion

A preliminary survey of trade and investment reforms and exchange rate policies has been discussed. The exchange rate regime of Indonesia was shifted from the pegged exchange rate against the dollar to a managed floating rate system. For the past twenty years, the Indonesian government has played an intervention role in the foreign exchange market in order to achieve certain macroeconomic objectives. The devaluations in the 1980s were combined with deregulation in trade, investment and pricing system. Devaluation served as a buffer to discount further oil price decline and led to more diversified utilization of resources.

The adjustment of nominal exchange rate captures the movement of macroeconomic variables, such as the real exchange rate, current account balance, inflation, terms of trade, government spending, capital flows, debt financing, and monetary aggregates. The thesis therefore is to study the linkage between export trade and economic growth on one hand, and export trade and real exchange rate on the other hand in Indonesia. Last but not least, quoted from the paper of Cole and Slade (1991) "the pattern in Indonesia since 1966 has been that when economic conditions become difficult and financial resources are scarce, there is a shift in policies toward greater reliance on market forces. When resources become more abundant, there is a shift to more bureaucratic, nonmarket-oriented allocation of those resources. The recent reforms are consistent with this pattern."

Note

1. Hill (1996) described the economic cycle of Indonesia (1967-1992) into four phases:
   A) Recovery, 1967 - 1973
   B) Oil Boom, 1973 - 1981
   C) Recession, 1982 - 1986
   D) Export growth, 1987 - 1992

Table 2.1 Chronology of Economic and Financial Reforms in Indonesia Since 1983

Policies	Year	Items	Contents
Trade and Investment	1985	1.	Reduction of tariff from 0-225% to 0-60%.
		2.	Imposition of countervailing non-tariff barriers (NTB).
	1986	3.	Producer-exporters and indirect exporters were given refunds or exemption facilities on import duties.
		4.	Reducing QR/NTB on several imported commodities, putting tariff barriers in their place.
		5.	Exempted manufacturers who exported at least 85% of their output from duties and limitations on the import of inputs.
		6.	95% foreign ownership possible for export oriented foreign investments.
		7.	Export oriented firms allowed to distribute domestically.
	1987	8.	Some change from import licensing to general imports.
		9.	NTB were lifted or modified in favour of further tariff adjustments.
		10.	Export licenses abolished.
		11.	Simplification of Textile Quota.
		12.	Deregulation of the securities market including equity participation by foreigners.
		13.	Liberalization of rules concerning joint ventures.
		14.	Reduction in the number of licences required for investment activities, especially the tourist industry.
	1988	15.	Removal of import monopolies: plastic and steel.
		16.	Inter-island shipping deregulation.
		17.	Joint ventures allowed distributing own products domestically.
	1989	18.	Reduction in the number of specific duties.
		19.	Reorganization and tariff classification.
		20.	Removal of Priority Scale List for investment through Board of Investment.
		21.	Reform of state-owned enterprises.
	1990	22.	Further removal of NTB to tariff.
		23.	Further tariff reductions (on average less than 40%) and reduce number of surcharges.
Exchange Rate and Exchange Control		1.	Basically no capital flows restriction. Residents are free to engage in short term external borrowing and lending and the deposit can be denominated in foreign currency.
		2.	Devaluation by 28% against US dollar in March, 1983.
		3.	Devaluation by 31% against US dollar in September, 1986.

Source: Anwar *et. al.* (1991); Cole and Slade (1991); Freris (1990), Nasution (1992), Sjahrir and Brown (1992), Tseng and Corker (1991).

Table 2.2 Indonesia's Major Macroeconomic Indicators, (Percentage Change, 1976-1992)

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
(Rp/US) (%)	-	-	50.6	0.3	-0.0	2.8	7.5	43.5	8.1	7.8	45.9	0.6	4.9	3.8	5.8	4.8	3.5
GNP (%)	24.4	21.9	19.2	39.8	42.2	29.4	7.7	22.9	15.3	8.6	5.8	20.6	13.8	17.7	16.9	16.4	14.3
GNP per capita (%)	26.4	19.2	16.5	36.6	37.9	26.1	5.3	20.2	12.8	6.6	3.5	18.1	11.5	15.4	16.4	14.5	12.4
CPI (%)	19.8	11.0	8.1	16.3	18.0	12.2	9.5	11.8	10.5	4.7	5.8	9.3	8.1	6.4	7.8	9.4	7.5
WPI (%)	15.0	13.6	9.9	49.3	26.7	11.3	7.2	18.1	11.0	4.8	2.3	19.3	4.9	8.6	10.0	5.1	5.2
WPI(exl. petroleum) (%)	18.1	13.8	9.8	33.9	18.7	9.9	8.5	19.7	13.1	4.3	8.4	15.1	10.4	7.7	6.8	7.4	6.1
Exports (%)	20.4	27.0	7.3	33.9	40.5	14.9	-11.3	-5.3	3.5	-15.1	-20.4	15.7	12.2	15.3	15.9	13.5	15.6
Crude oil exports (%)	14.6	20.8	2.8	15.8	43.7	13.0	6.2	-16.8	-12.3	-29.3	-34.6	-3.1	18.0	-19.5	22.2	-5.9	-7.0
Imports (%)	18.9	9.8	7.4	7.7	50.4	22.5	27.0	-3.0	-15.1	-26.1	4.5	15.4	7.1	23.5	33.5	18.5	5.5
M1 (%)	28.1	25.3	24.0	35.8	48.3	29.2	10.0	6.4	13.3	18.0	14.9	9.2	13.3	42.9	15.9	12.1	7.9
M2 (%)	31.2	19.5	21.6	37.0	47.8	25.9	14.1	32.5	22.3	29.2	19.1	22.8	24.1	39.1	44.7	17.5	19.8
M1/GNP (%)	10.6	10.9	11.4	11.1	11.5	11.5	11.8	10.2	10.0	10.9	11.8	10.7	10.6	12.9	12.8	12.3	11.6
M2/GNP (%)	17.4	17.1	17.4	17.1	17.7	17.3	18.3	19.7	20.9	24.9	28.0	28.5	31.1	36.8	45.5	45.9	48.1

Source: *International Financial Statistics, CD ROM*, International Monetary Fund, 1995.

Figure 2.1 The Oil and Non-oil Exports

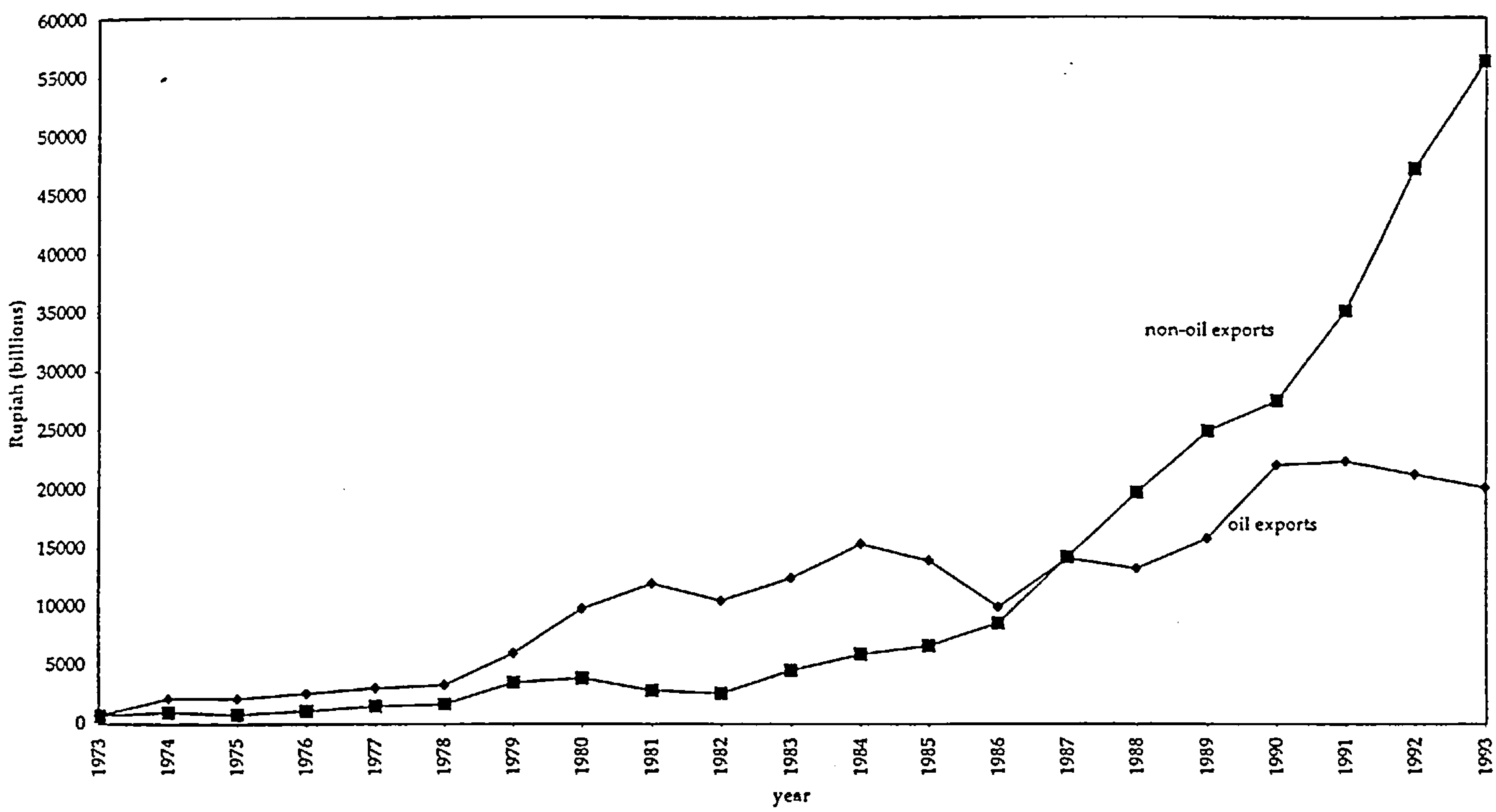


Figure 2.2 The Percentage of Oil and Non-oil Exports to GDP

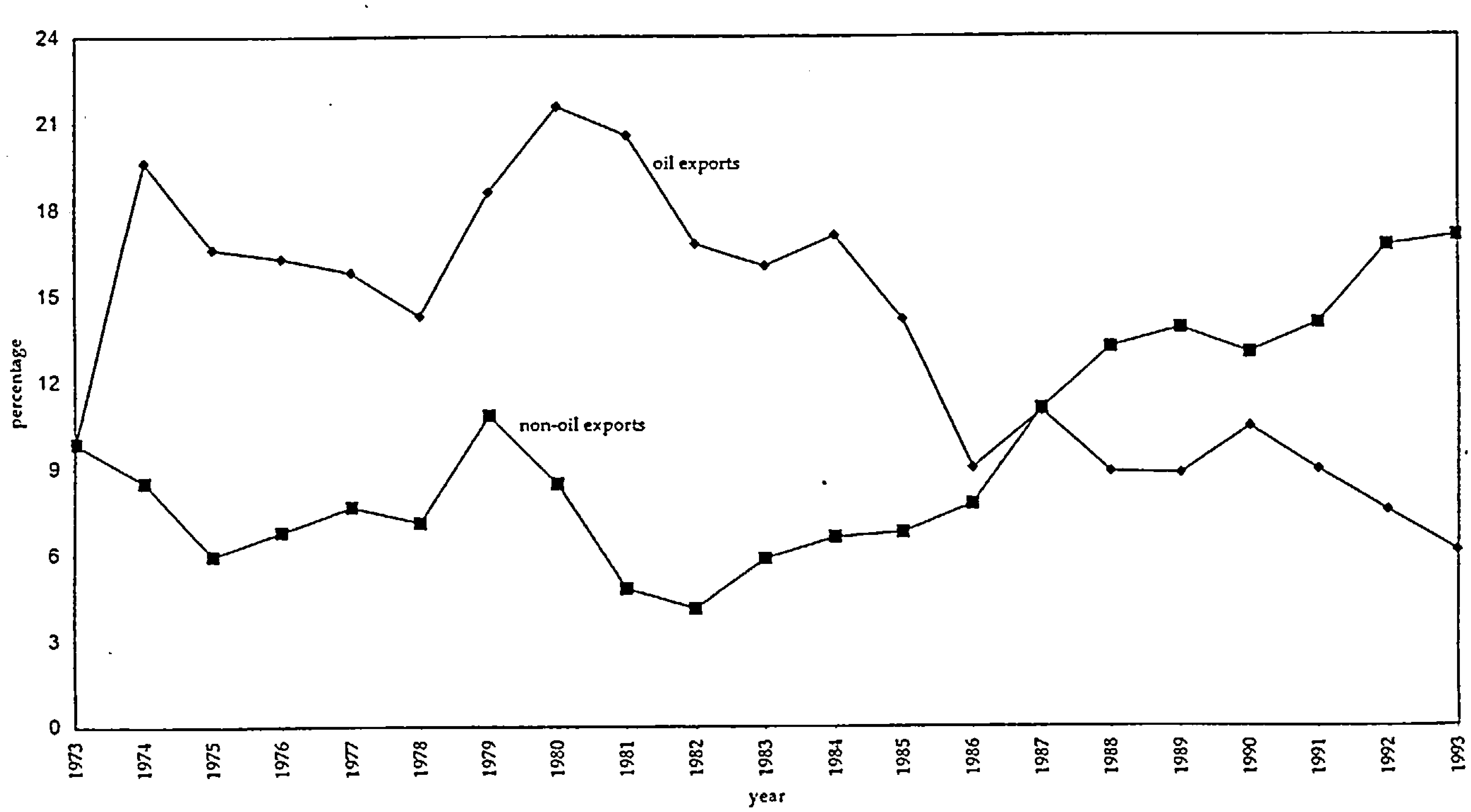


Figure 2.3 The imports

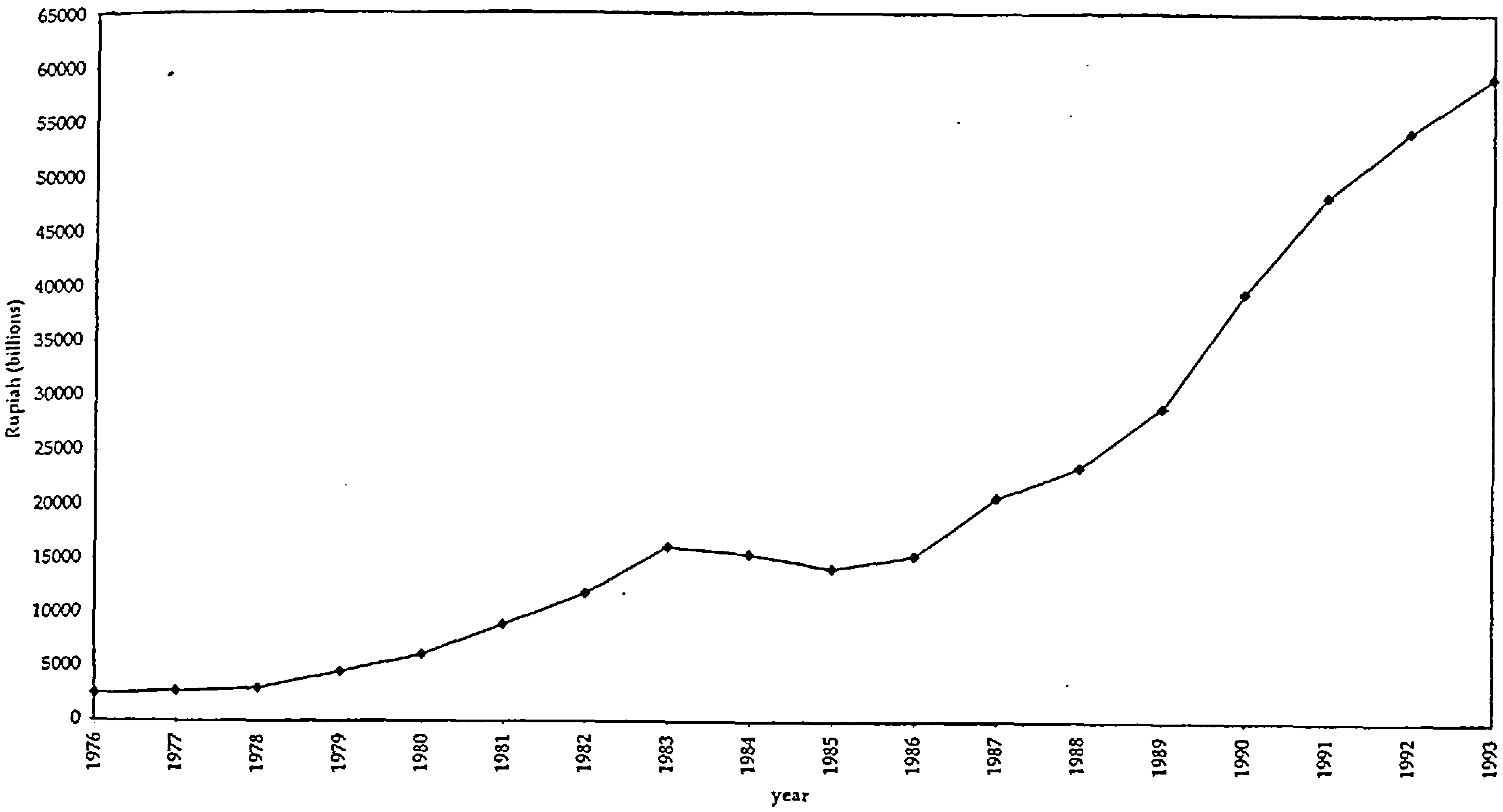


Figure 2.4 The Percentage of Total Exports and Imports to GDP

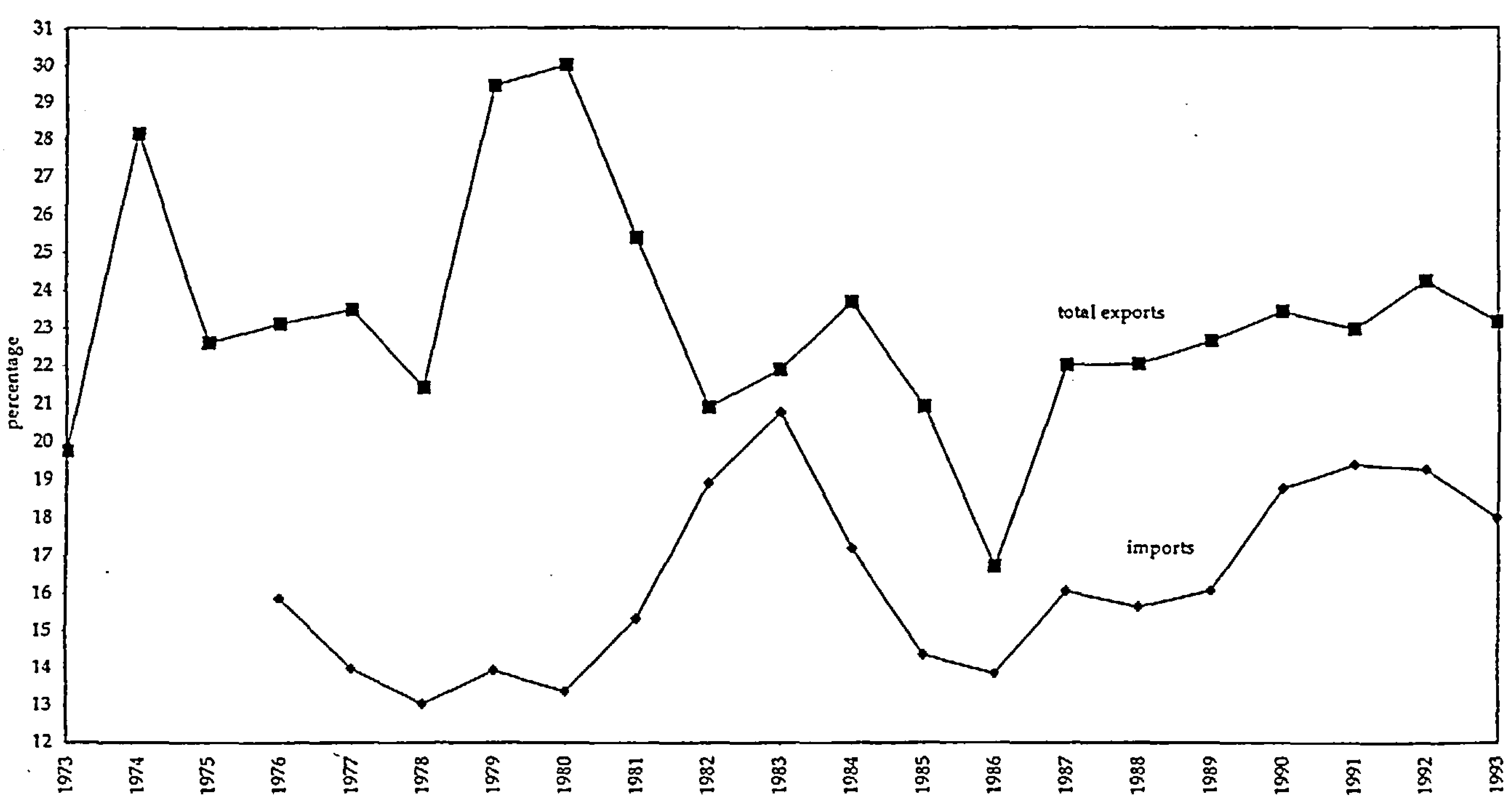


Figure 2.5 Annual GDP Growth

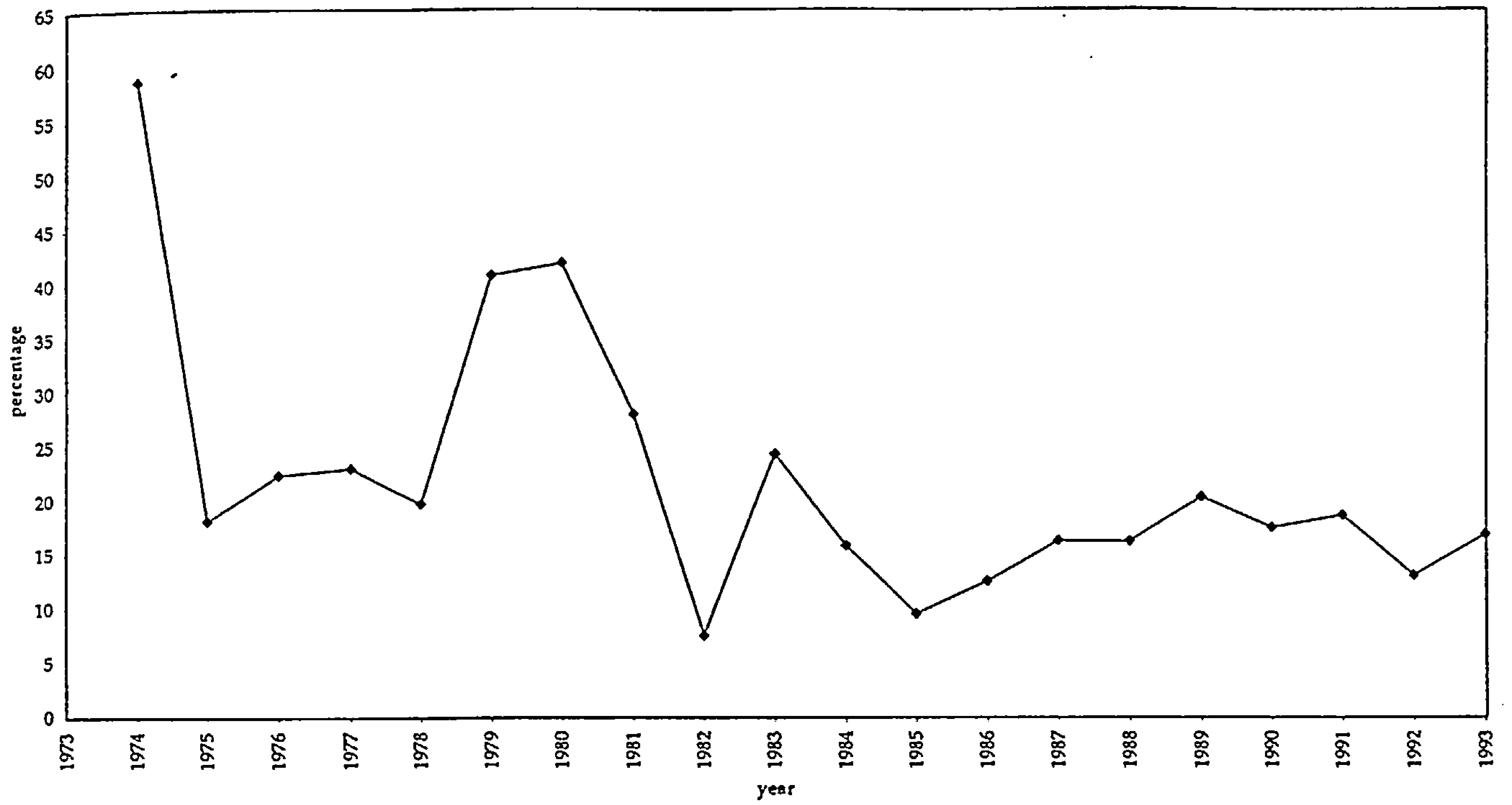


Figure 2.6 Inflation Rate

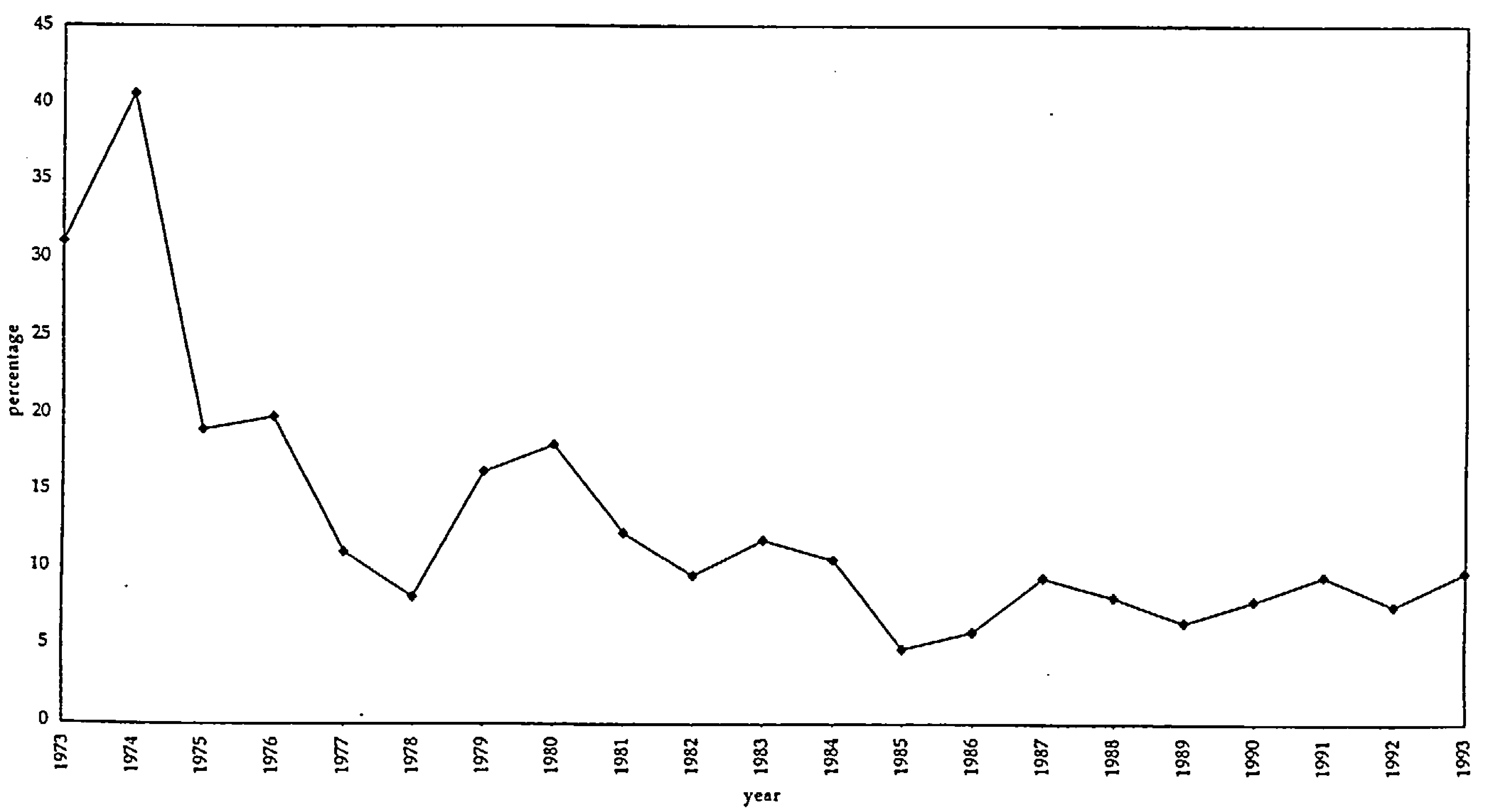


Figure 2.7 Rupiah-US Exchange Rates

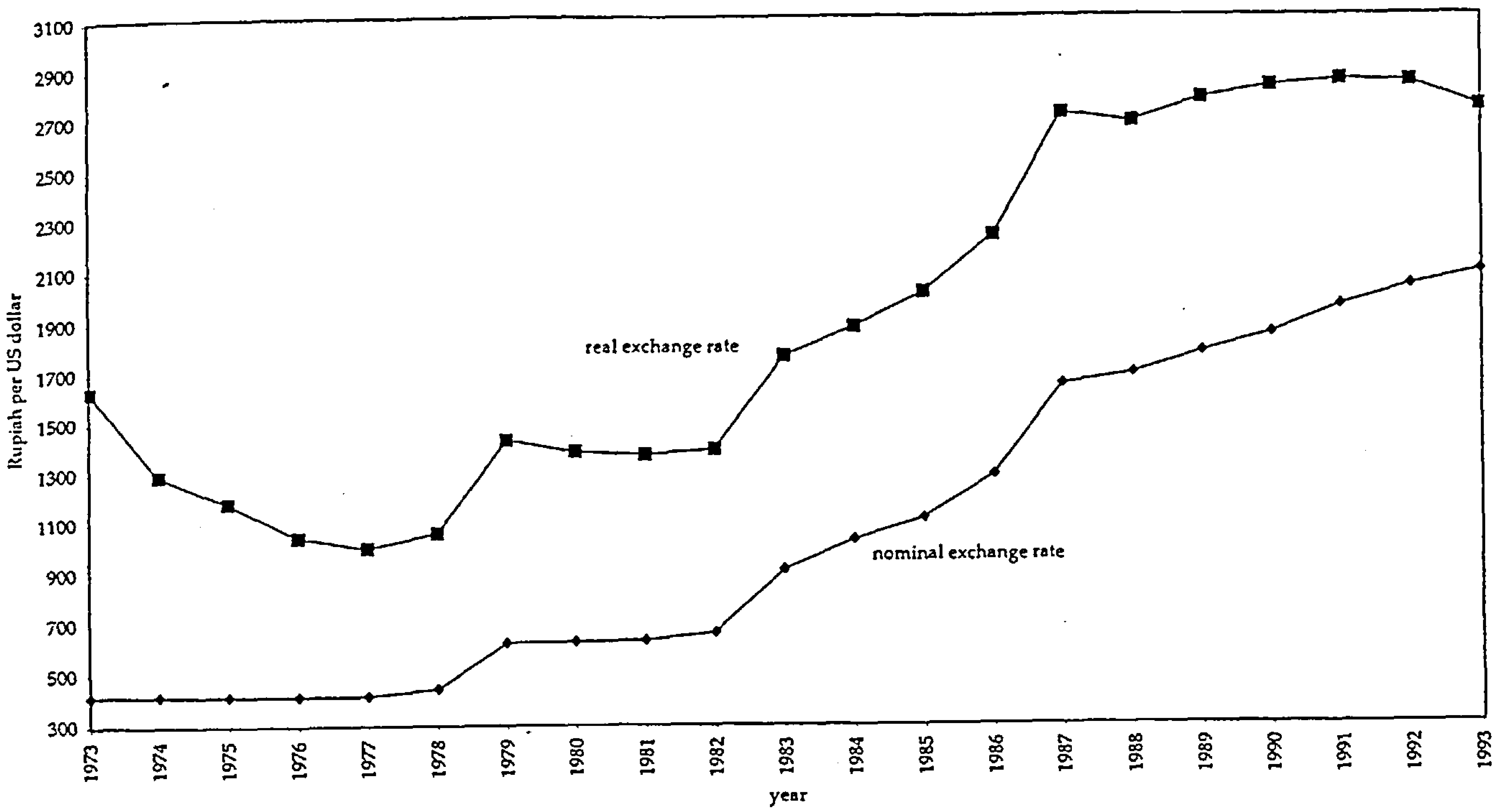


Figure 2.8 Rupiah-Yen Exchange Rates

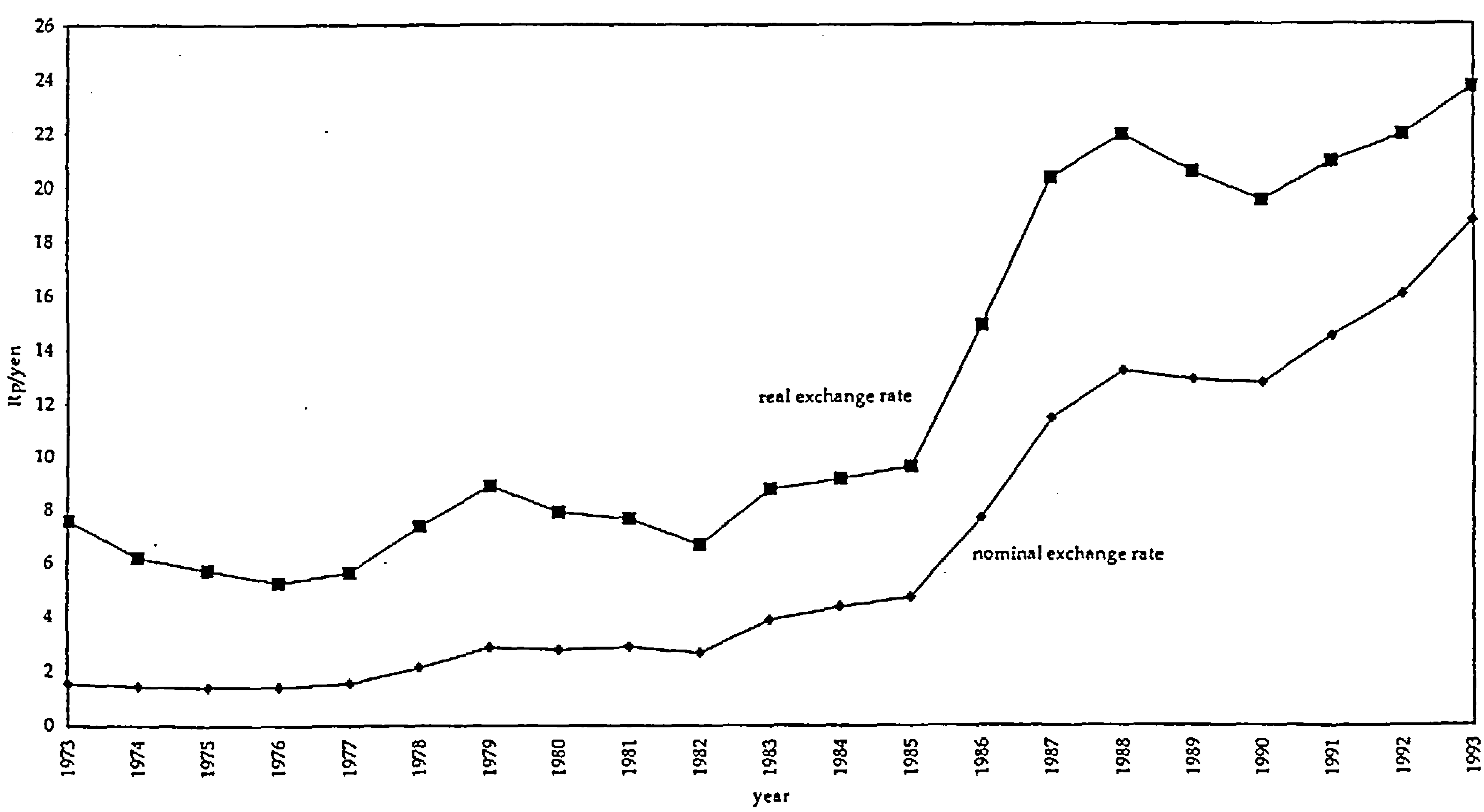


Figure 2.9 The Government Expenditure

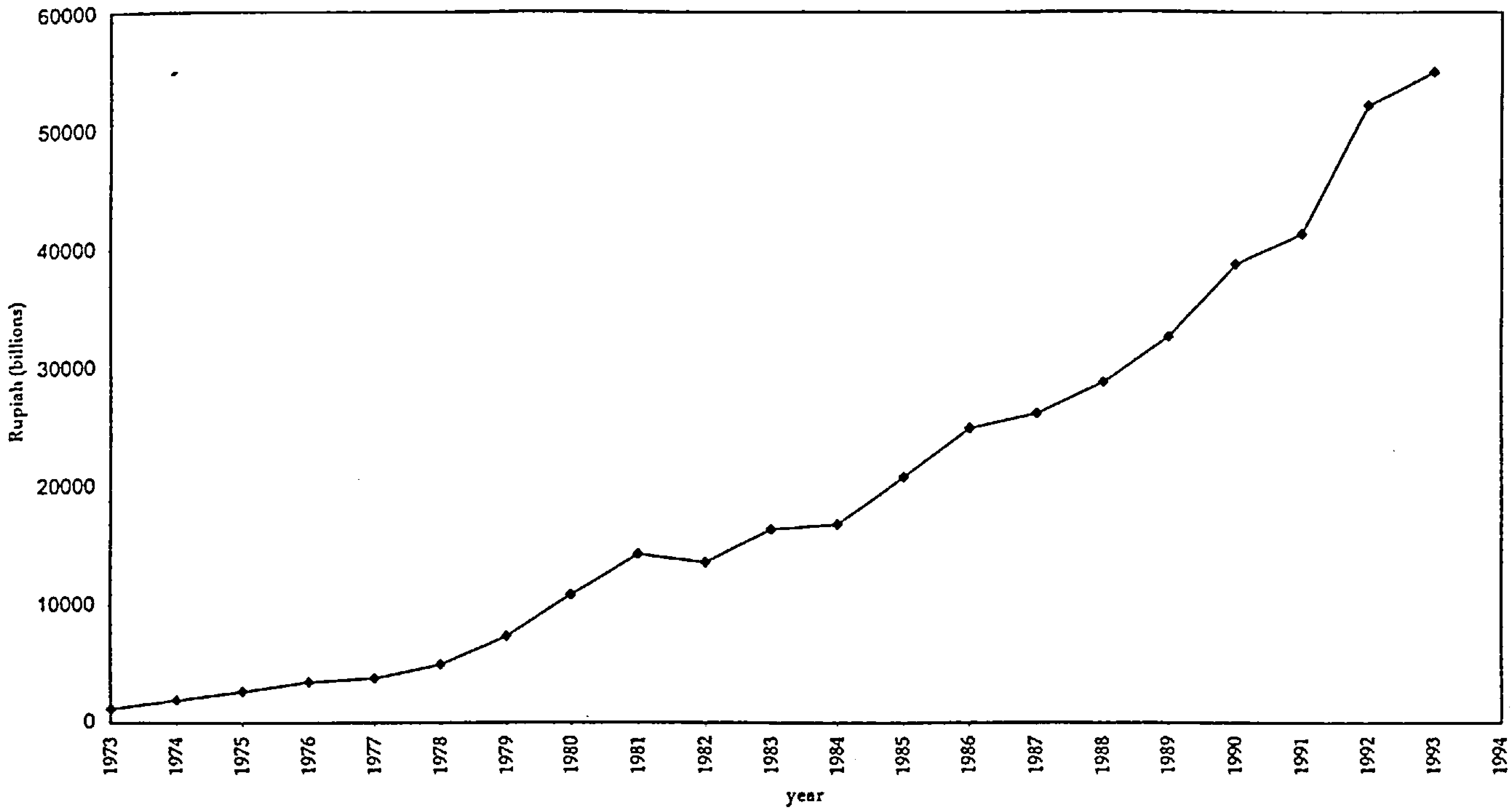


Figure 2.10 The Pecentage of Government Expenditure to GDP

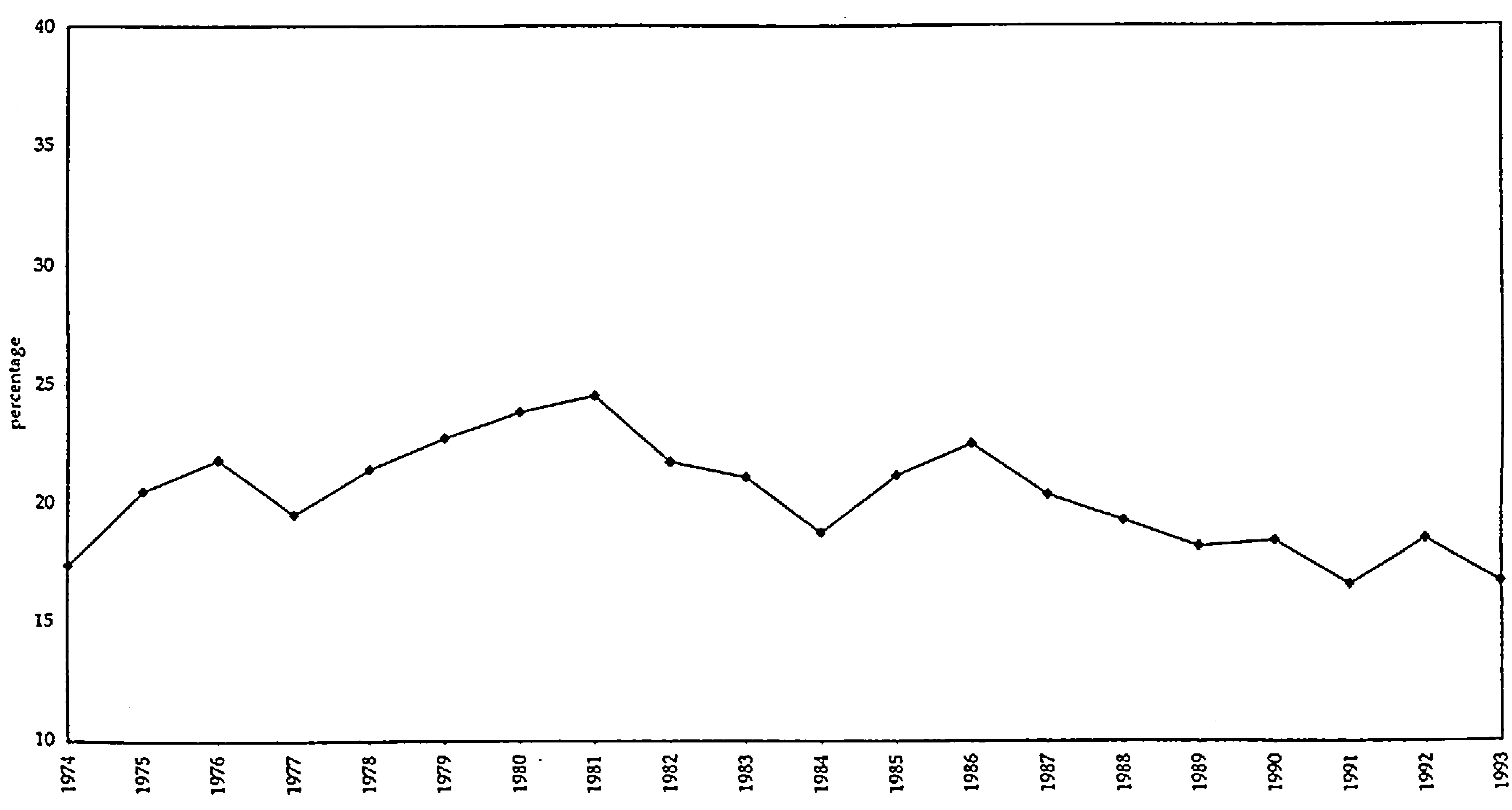


Figure 2.11 The Direct Investment

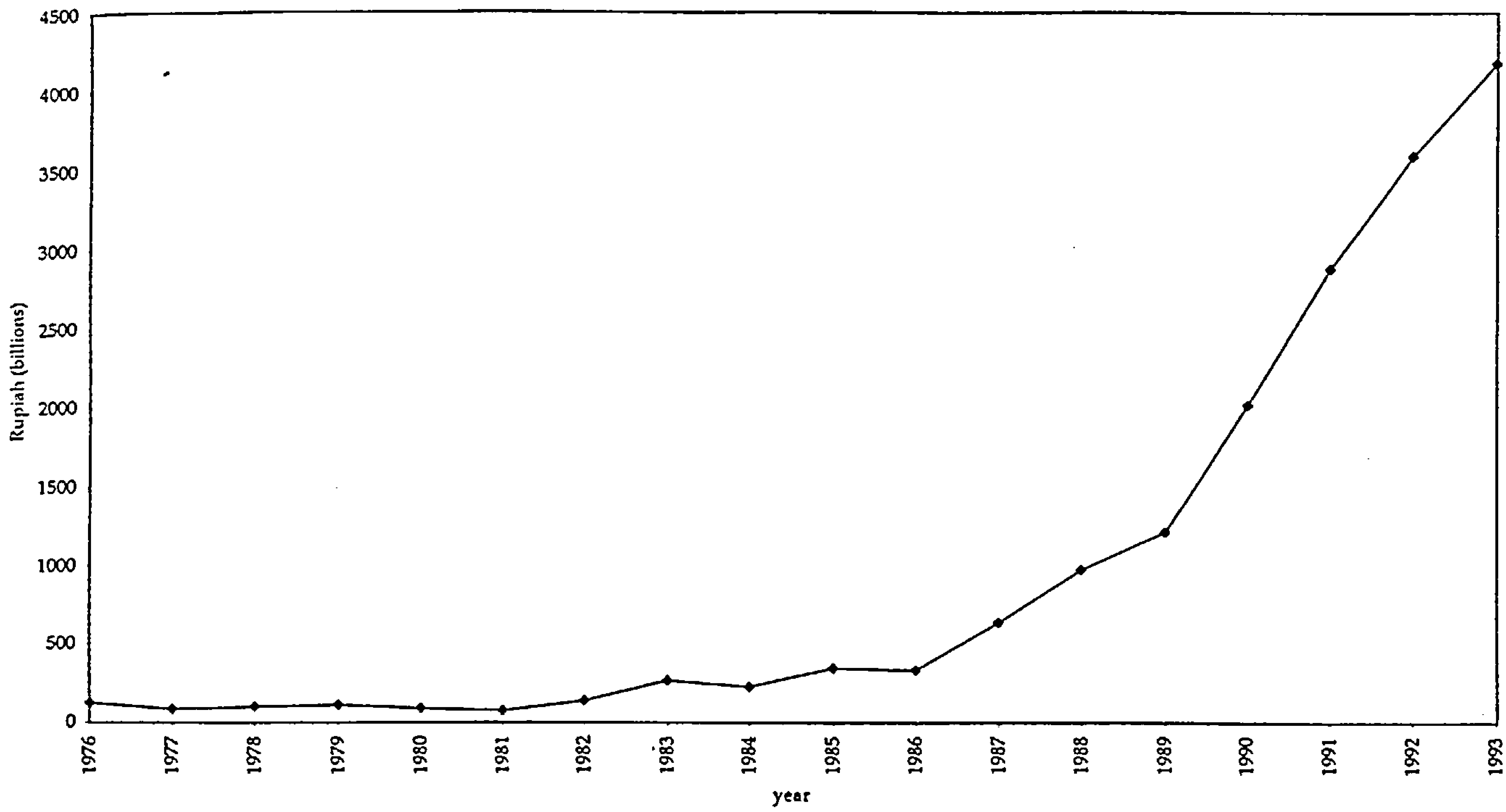
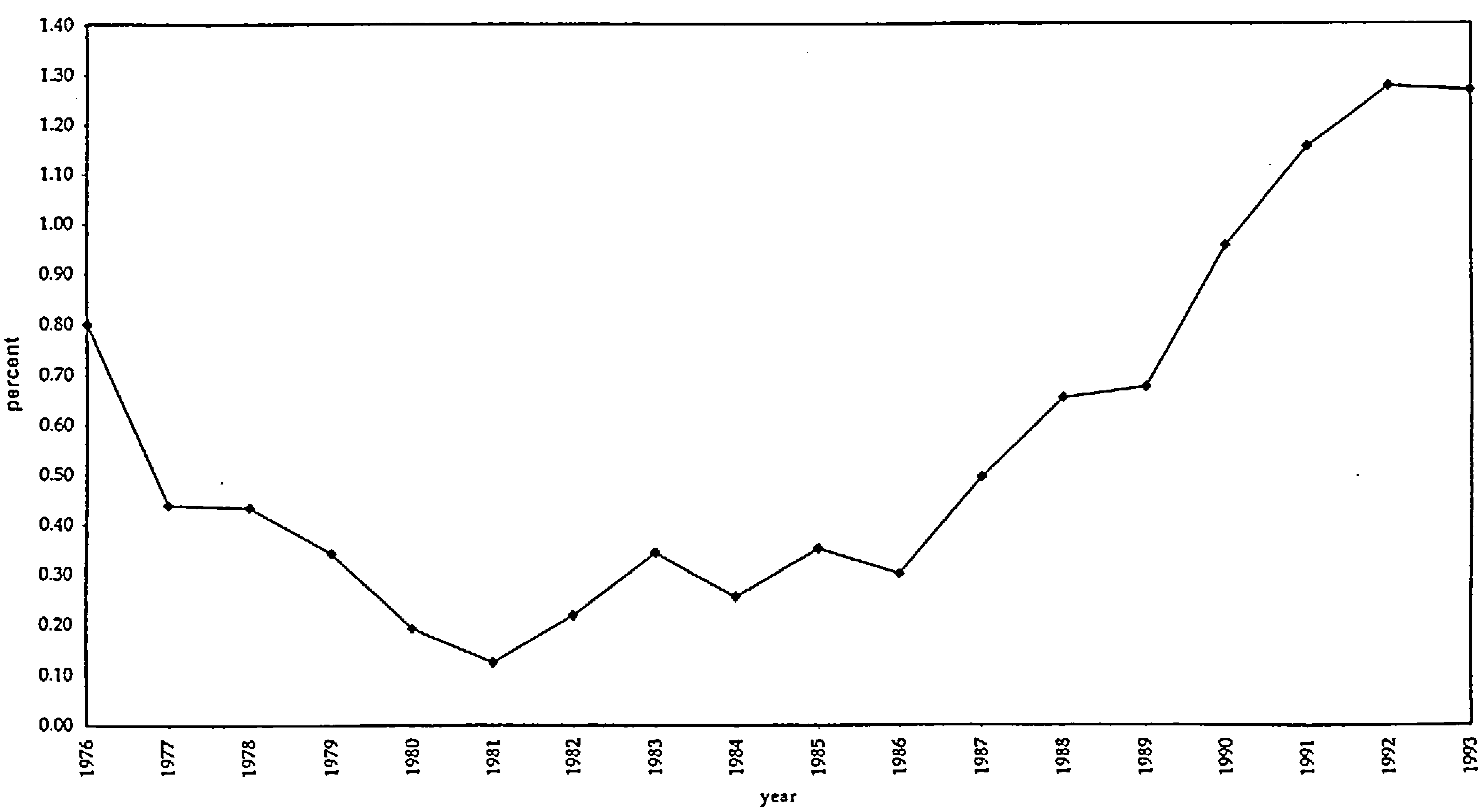


Figure 2.12 The Percentage of Direct Investment to GDP



Chapter 3 Export Performance and Economic Growth

3.1 Export Growth and Trade Liberalization in Indonesia

Indonesia experienced industrialization from the mid-sixties. With its abundant natural resources, early industrial development was heavily dependent on extractive industries. Exploitation and processing of oil, wood and minerals were the roots of the domestic economy. These extractive industries not only sustained employment and economic growth, but also generated considerable government revenues and foreign exchange earnings. However, Indonesia's fundamental shortage of infrastructure and maintenance repairs, recurrent balance of payments deficit and hyperinflation in the sixties had driven the authority to focus on stabilization and rehabilitation of the economy.[1] Manufacturing sector was then one of the smallest in the developing countries in the mid-sixties. Much of the export products were traditional agricultural commodities and oil-related products. With oil price increased in the early seventies, Indonesia earned substantial government revenues and foreign exchange earnings. The effects from resource endowment or so-called the "Dutch Disease" has given an explanation for the sluggish momentum of manufacturing sector.

DeRosa (1986) provides a weighty survey on trade and protection in the Asian developing countries region. He argues that protection measures are widely used in the Asian countries. Both tariff and non-tariff barriers are commonly reinforced. Table 3.1 shows some principal import barriers by the Standard International Trade Classification (SITC). By definition, frequency ratios is referred to the number of occurrences of a given trade barrier against products in a given trade category relative to the total number of items in the category. The main trade protections are the average ad valorem rates, ASEAN preference rates, sales taxes, restrictive licensing and prohibitions. In most of the SITC sections, frequency ratios are significantly high for the average ad valorem rates. The lowest ratio is about 70% against imports of beverage and tobacco (SITC 1). Except machines and transport equipment (SITC 7), 100% sales taxes are imposed in all sections. Restrictive licensing are also imposed in basic manufactures

(SITC 6) and in machines and transport equipment (SITC 7). However, high import barriers actually distort the progress of industrialization. Even though there are plenty of labour supply in the manufacturing production, large degrees of importation of machines and technology with high tariff rates have reduced domestic production, which ultimately cause welfare loss and international competitiveness. The export sector is widely suppressed.

Hill (1992) explained that there were four phases in characterizing the economic stabilization and trade liberalization in Indonesia. The first phase happened in the late 1960s when there was great consumer demand with speedy economic growth and new investment chances. The second phase was between 1973 and 1981. This period was captured by the rise of oil prices, which made the government initiate investment opportunities in the resource-based industries. The "Dutch Disease" effect of dampening the development of manufactures and industrial growth was greatly affected. In regard to the protection of the non-oil sector, two devaluations were pursued in 1971 and 1978 respectively, of which Corden (1984b) named as the policy of "exchange rate protection". It was a policy to avoid real appreciation, and therefore protecting tradables at the expense of non-tradables (Corden, 1984b). The third phase was in 1981-1985. It was a period of industrial policy reassessment. A package of reforms has been promulgated. The last phase commenced in 1985 of which less state intervention was advocated. The policy was to switch from import substitution to export promotion and to increase market signalling of the private sectors.

The change of industrial policy to a more export-oriented basis was developed from the early 1980s. The heyday of oil hike has gone. The immerse balance of payment problem, the deterioration of terms of trade and the increase debt service ratio all forced the government to initiate structural adjustment for trade and development. Trade and investment reforms were thus implemented.

Table 3.2 shows an abstract of trade and investment reforms, which is summarized in Anwar & *et.al.* (1991).[2] The reasons for reforms were clear. The objectives were to decrease the dependence of import substitution, open domestic market, improve both domestic and foreign investment climates, and reduce state intervention through privatization and to have better resources allocation.

Table 3.3 shows the trade statistics of exports and imports in Indonesia. For the external trade, the total export value first declined from 1981 but increased from 1987. Sundrum (1988) argued that a decline in GDP was partly due to a weak aggregate demand, which caused decline in investment. Government's deficit budget and slow monetary growth further dampened output growth, which made the total export value decrease. The value of merchandise exports was also adversely affected. However, the growth trend of both values was impressive especially in the second half of the eighties. By the SITC export categories, the growth of food and live animals, crude materials and mineral fuels remained strong. The sectors were heavily weighted because these were traditionally Indonesia's main international commodity trades. However, the total value of mineral fuels declined from 1981. The decline could be explained by the diversification of trade so that more non-oil exports were produced and exported. Devaluations in 1983 and 1986 reduced total revenue of mineral and petroleum production. Export growth of the manufactures on the other hand, was increasing. The total export values of basic manufactures, machine and transport equipment and other miscellaneous manufactured goods have substantially increased between 1980 and 1992. No wonder Hill argued that Indonesian industry was extraordinarily diverse and to speak of the 'industrial sector' as a homogeneous entity was clearly misleading (1992, p.206). Moreover, Indonesia's direction of trade was basically intra-regional. Table 3.3 shows that Japan, Singapore, Korea, China, Hong Kong and Australia were the main trading partners and totally shared 60.57% of total exports in 1991. Trading with China was astonishing. There was only 0.1 million US dollars trade with China in 1980, compared with 1190.9 millions in 1991.

Another aspect to understand the industrial development in Indonesia was to compare the performance of manufacturing value added (MVA) growth. By definition, MVA is estimated in accordance with the national accounting concept, which represents the net contribution of the manufacturing sector to gross domestic product (GDP).[3] Roepstorff (1985) reported that the share of world MVA of Indonesia was 0.29% in 1981 —– the seventh rank after Brazil, Mexico, India, South Korea, Argentina and Turkey among the developing countries.[4] Table 3.4 shows the annual growth of MVA, 1975-1990. Using 1980 as the base year, the growth rate between two periods (1975-1985 and 1985-1990) was 14.5% and 10.6% respectively. The rates were even higher than the newly industrialized countries, such as Hong Kong and Taiwan. The total MVA index of Indonesia in 1990 was 304 and it was only smaller than in South Korea. The per-capita MVA also ranked second among the Asian countries. The table confirms that Indonesia has achieved sound industrial performance in the last two decades. Hill (1990c) argues that Indonesia's strong export growth, driven by resource- and labour-intensive goods in most years, has generated over 80 percent of the total (p.201).

Export specialization can be exemplified by the index of Revealed Comparative Advantage (RCA). It is defined as the ratio of the share of a given product group in total manufactured exports for a given country to that for the reference group.[5] Table 3.5 shows the exports, imports and RCA indices by different trade group of manufactures. The product group is selected by either its high export share or by high RCA index. For the first three groups, namely, Food products (SITC 0), Simply processed materials (SITC 2) and Petroleum products (SITC 332), the export shares and the RCA indices decrease notably. On the other hand, the groups of SITC 4, SITC 56, SITC 63, SITC 65, SITC 82, SITC 84 and SITC 85, indicate significant growth in both shares and RCA indices. Among those groups, wood and cork manufactures, textile yarn and fabric, furniture and footwear demonstrate tremendous increases. The statistics show strong growth trends in product diversification as well as the non-oil manufacturing sectors.

The role of foreign investment in export promotion strategy is uncontroversial. Hill (1988) argues that "the most important factor determining the contribution of foreign investment to Indonesian economic welfare has not been the (source) country composition, the industrial distribution, or the particular entry modalities of foreign investor. Rather, it has been the general economic and political environment, and the specific policy parameters to which foreign firms have responded" (p.152). Harmonious economic and political environments attract foreign capital inflow and investment. Favourable deregulation measures have been implemented in the mid-eighties such as permission up to 95% foreign ownership for foreign investment, joint ventures in government export credit scheme, deregulation of investment and capacity licensing and removal of Priority Scale List for investment through Board of Investment, *etc.*.[6] These new measures unquestionably provide new surge of investment, notably from the NICs to Indonesia. Thee (1991) concludes that with deregulation carried out in the mid-eighties, most of NICs' investment are export-oriented in nature and unlike the inflows of 1970s and of early 1980s, investment are basically resource-oriented. Parker (1991) also confirms that most new investment has flown into the export-oriented sectors. About 70% of all investment project approvals, both domestic and foreign, are reported as export-oriented.

Table 3.6 shows the approved new foreign investments by sectoral distribution in 1986-91. The most striking feature is the huge increase of approved new foreign investment in manufacturing sector. The growth of servicing sectors is impressive. Trade and tourism, real estate and other services indicate high capital inflows in these sectors. Investment propensity has been more diversified than before. Whether Indonesia would become another NIC, as Soehoed (1988) argues, may depend on the "increase of domestic purchasing power, improved efficiency in agriculture and more public works. This will create buying capacity which is needed for domestic industry to develop and be exposed gradually to competition from abroad" (p.49). Trade liberalization in Indonesia, therefore, is crucial to export-economic growth.

The content of the chapter is divided as follows: Section One examines export growth and trade liberalization in Indonesia. Sections Two and Three explain the determinants of export-led growth. Two export growth models are introduced, namely, the balance of payment constrained growth model and the neoclassical model. Empirical analysis and results are documented. As quarterly data are used in the above section, Section Four mentions the reliability of interpolation, simpler models are tested with annual data. Conclusion is in Section Five.

3.2 Determinants of Export-led Growth: Balance-of-Payments Constrained Growth Model

Thirlwall (1979, 1980) and Thirlwall and Dixon (1979, 1994) significantly develop the balance-of-payments constrained growth model. They state that exports and investments are exogenous in the Keynesian model. Under the fixed exchange regime, the volume of exports and imports are insensitive to the changes of relative prices, and hence, the level of output is used to ensure the equilibrium adjustment in the balance of payments. This type of export-led model, Thirlwall claims, "relieves a country of a balance-of-payments constraint on demand, so that the faster exports grow, the faster output growth can be without running into balance-of-payments difficulties" (1989, p.363). Thirlwall's growth model assumes that the current account balance of payments is written as:

$$P_d \bullet X = P_f \bullet M \bullet E \tag{3.1}$$

where P_d and P_f are the average price of exports and the average foreign price of imports respectively. X is the quantity of exports and M is the quantity of imports. E is the domestic price of foreign currency. Thirlwall also shows that export and import functions are in the multiplicative form:

$$X = \left(\frac{P_d}{P_f\ E}\right)^{\eta} Z^{\varepsilon} \tag{3.2}$$

$$M = \left(\frac{P_f E}{P_d}\right)^{\psi} Y^{\pi} \tag{3.3}$$

where Z and Y are foreign and domestic income; η and ψ are the price elasticity of demand for exports and imports (η and $\psi < 0$); and ε and π measure the income elasticity of demand for exports and imports respectively (ε and $\pi > 0$). Taking the rate of change of the variables from 3.1 to 3.3, the growth rate of each equation will be:

$$(p_d + x) = (p_f + m + e) \tag{3.4}$$

$$x = \eta(p_d - p_f - e) + \varepsilon(z)$$

(3.5)

$$m = \psi(p_f + e - p_d) + \pi(y)$$

(3.6)

In the balance of payment accounting, Eq. 3.4 states that the growth rate of export values is the same as the growth rate of import values. Substituting Eqs. 3.5 and 3.6 into 3.4 and gives:

$$p_d + \eta(p_d - p_f - e) + \varepsilon(z) = p_f + \psi(p_f + e - p_d) + \pi(y) + e$$

(3.7)

then solves Eq. 3.7 in terms of *y*, and therefore:

$$y = \frac{(1 + \eta + \psi)(p_d - p_f - e) + \varepsilon(z)}{\pi}$$

(3.8)

Thirlwall argues that any change in exchange rate will have an equiproportionate change in relative prices and hence the real terms of trade is assumed to be zero. That is, $(p_d - p_f - e) = 0$. Eq. 3.8 is then reduced to:

$$y = \frac{\varepsilon(z)}{\pi} = \frac{x}{\pi}$$

(3.9)

or in the logarithmic form:

$$\log Y_t = (1/\pi)\log X_t + \varepsilon_t$$

(3.10)

Eq. 3.9 is the balance of payments constrained growth model. Economic growth therefore, equals to the export growth times the reciprocal of domestic income elasticity of imports. Thirlwall and Dixon

(1994) states that "an increase in exports will automatically induce an increase in imports of the same magnitude" (p.408).

McGregor and Swales (1985, 1991), however, assert their criticism of the theory:

1) Variables in the export and import equations are very aggregative. There is no distinction between traded and non-traded goods. High degree of aggregation implies the non-existence of diversity among the commodities, which causes serious problems in the statistical analysis.

2) The theory cannot give explanation for high degree of intra-industry trade and the high-income elasticity demand for imports in developed countries. The varieties are in fact due to economies of scales and diversified demand for manufactured goods produced in those countries.

3) It is unrealistic to assume that the real terms of trade, or the law of one price, in logarithmic form, (p_d - p_f - e), is zero. The validity of the law of one price remains questionable in the recent literature. Moreover, the term does not address any non-price competition such as advertising, marketing, etc. in the model.

McGregor and Swales (1985) then test the validity of Thirlwall's theory and find no statistical support for Eq. 3.9. They conclude that the theory "cannot be derived in a manner consistent with the notion of export led growth except under very restrictive assumptions which are unlikely to be met except fortuitously......and (it) does not represent a general law" (p.30).

The controversy over the validity of the balance of payment constrained growth model has been rekindled by the recent work of Bairam (1990), Bairam and Dempster (1991), Hieke (1997), Atesoglu (1997), McCombie and Thirlwall (1994) and Thirlwall (1997). In their papers, Bairam (1990) and Bairam and Dempster (1991) generally support Thirlwall's specification of the trade multiplier. That is, the Harrod foreign trade multiplier determines the overall economic growth. They suggest that in an open economy, relevant economic management is the factor that manipulates the income elasticities of exports and imports. Hieke (1997) subdivides the US economy into two periods: 1950-66 and 1967-90. He finds support of the Thirlwall's Law by using the concept of cointegration. On the other hand, there is no direct impact of export growth on the actual growth performance of the US economy in the later quarter-century. He concludes that the paper cannot be interpreted as evidence of a direct, secular, causal relationship between the rate of growth of exports and the rate of growth of income. Atesoglu (1997) also uses time series data of the US economy. He finds that real exports and real income are cointegrated during 1931-94 period. The findings imply strong support for the balance-of-payments-constrained Harrod-Thirlwall model. In the long run, real exports and real income in the US can be expected to move together over time. Using international data of developed countries, McCombie and Thirlwall (1994) claim that the model and the empirical evidence lend to strong support to the export-led growth. They argue that the simple policy conclusion for most countries is that if they wish to grow faster they must first raise the balance-of-payments constraint on demand. If the balance-of-payments equilibrium growth rate can be raised by making exports more attractive and by reducing the income elasticity of demand for imports, demand can be expanded without producing balance-of-payments difficulties. Demand can then generate its own supply by encouraging investment, absorbing underemployment, raising productivity growth and so on. Therefore, the international difference of economic growth lies in differences in the rate of demand growth, and the major constraint on the rate of growth of demand in most countries is the balance of payments (p.244).

3.2.1 Methodology

As described by Atesoglu (1997), the key prediction of Thirwall's model of growth is that, in the long run, a country's growth rate of real income is equal to the real income growth rate, which is consistent with current account balance. The hypothesis of the model, therefore, can be tested with the application of the Johansen's (1988) maximum likelihood estimation technique. Johansen's test also eliminates biases against small sample measurement errors. Consider an n-dimensional VAR:

$$X_t = \Pi_1 X_{t-1} + \Pi_2 X_{t-2} + \ldots\ldots + \Pi_k X_{t-k} + \varepsilon_t \tag{3.10}$$

where X is an nx1 random vector in I(1) order and $t = 1,\ldots, T$. e_t is i.i.d.. Since Eq. 3.10 appears to be non-stationary, a first difference form of Eq. 3.11 is written as:

$$\Delta X_t = \sum_{i=1}^{k-1} \Gamma_i X_{t-i} - \Pi X_{t-k} + \mu_t$$

(3.11)

where

$$\Gamma_i = -I + \Pi_1 + \ldots \Pi_i, \quad \Pi = I - \Pi_1 - \ldots \Pi_k$$

(3.12)

The test is to examine *nxn* Π matrix. When the matrix has a full rank *n*, then the elements of series *X* are stationary. If the element of series X has the rank such that rank (Π) = $r < n$, there are *r* cointegrating vectors among the elements of series X and $n - r$ common stochastic trends. The matrix Π can be decomposed into two matrices α and β′ and:

$$\alpha\beta' = \Pi$$

(3.13)

β′ is the cointegrating vector that analyses the long-run relationship of series *X* and α is the adjustment vector that captures the speed of adjustment.

3.2.2 Empirical Results

In terms of empirical analysis, Eq. 3.9 states that in the long run, y_t is cointegrated with x_t and $(1/\pi)$ is the cointegration coefficient. Sample data of Real GDP (Y) and non-oil real exports (NOEX) of Indonesia are extracted from the IMF *CD Rom*. The quarterly series covers from 1975 to 1993. Since most of the economic series are non-stationary, we use the Augmented Dickey-Fuller (ADF) and Phillps-Perron (PP) tests to examine the order of integration. Table 3.7 shows the unit root test results. The optimal lag is chosen by the Akaike information Criterion (AIC). They indicate that real income and real exports are integrated at order one. Applying first differences confirm the series are stationary.

Hieke (1997) argues that empirical findings on various alternative sample periods are sensitive to a particular time span. As Indonesian government devalued the currency in March 1983, one might wonder if the devaluation would relax the balance-of-payments constraint by exporting manufactured goods cheaper. It is logical to divide the full sample size into two sub-periods: 1) 1974Q1 to 1983Q1; and 2) 1983Q2 to 1993Q4. Table 3.8 shows the Johansen Maximum Likelihood cointegration tests. We have tested the order of VAR of 2, 3, 4, 5 and 6. It is found that the order of VAR is not sensitive to the determination of cointegrating ranks. By not risking the problem of over-parameterization, the order of 4 for VAR is chosen. Except for the sub-sample size of 1975Q1 to 1983Q1, the overall results are in favour of one cointegration in the various alternative sample periods. Moreover, the normalized cointegrating vectors (both full and sub-samples) indicate that there is a positive relationship between non-oil exports and income.

The results may not be in line with Hieke's (1997) argument that different sample periods are sensitive to different results. Instead, the expansion of export growth will relax the balance-of-payments constraint and trigger higher economic growth. Devaluation in the 1983 promoted diversification of manufacturing production. Finding the cointegration relationship proves critical assumptions behind the balance-of-payments constrained growth.

3.3 Determinants of Export Growth: The Neoclassical Export-Growth Hypothesis

Another conventional wisdom about the export-led growth is of its ability to set up virtuous cycle for growth. Competition between export and non-export sectors for the use of economic resources will make the former generate positive externalities to the non-export sectors, through improved production techniques and efficient resource allocation. Therefore, expansion of export sector at the expense of other sectors will induce resources shift into export production and bring positive net gain to total production and aggregate output. One of the pioneers to formulate export-growth synthesis into a theoretical model is Feder, whose article (1983) provides a two-sector model with a classic Cobb-Douglas production function. The export and non-export production functions are:

$$X = G(L^x,\ K^x)$$

(3.14)

$$NX = F(L^{nx},\ K^{nx}, X)$$

(3.15)

where L^j and K^j are labour and capital utilized in export and non-export sectors, (j = X, NX). Assuming aggregate output is the sum of export (X) sectors and non-export (NX), Feder derives the equation for the rate of change of output as follows:

$$\frac{\Delta Y}{Y} = \alpha_1 \frac{I}{Y} + \alpha_2 \frac{\Delta L}{L} + \left(F_x + \frac{\delta}{1+\delta}\right)\frac{X}{Y} \bullet \frac{\Delta X}{X}$$

(3.16)

where "Δ" measures the rate of change of a variable, I/Y is the investment ratio, F_x measures the externality effect (the marginal productivity of X in NX sector). If F_x is zero, it means that there is no externality effect and the export growth will have no effect on the non-export (NX) sector. δ measures the productivity differential between non-export and export sectors. Productivities across sectors are identical and the resources are optimally allocated if δ equals to 0. When $\delta = F_x = 0$, Eq. 3.16 will reduce to a standard production function. An essential explanatory variable of the equation is (X/Y)(ΔX/X). Positive and statistical significance of its coefficient confirms the theory that the marginal productivities in the export sector is higher than in the non-export sectors. Using 31 countries for estimation, Feder strongly confirmed positive externalities spreading from export to non-export sector.[7] Even though Feder's two sectors model has provided theoretical analysis for the export-led growth, his results are subjected to some limitations. Firstly, a two-sector model is very restrictive. Unconventional variables such as government and imported intermediate inputs should be included (Ram 1987). Secondly, some econometric problems such as the non-stationarity nature of the series, specification of time lags are ignored in the model.

3.3.1 The Expanded Model

In order to measure the effects of export growth to economic expansion, the standard production function of neoclassical model is expanded by including some "unconventional variables". The inclusion of the variables is to give more thorough and reasonable explanations to export-economic growth. The rationale behind the model is: 1) The relation of capital and labour inputs to economic growth is too restrictive to output growth. We expand the two-factor model of neoclassical export-growth hypothesis by including "unconventional variables" to the production relationship, as suggested by Balassa (1978), Ram (1985, 1987) and Sheehey (1992). Yaghmaian (1994) also challenges the results of the empirical literature in support of the neoclassical theory of export-led growth and provides a theoretical and empirical alternative, that prior economic development and structural change determine both exports and economic growth. Hence, the model we use is to provide additional explanatory variables which are best fitted to the Indonesian economy; 2) The dependence on oil-related production traditionally became the dominant source for government revenue and output growth in Indonesia. Trade and investment reforms quickened the development of non-oil export sectors. The development of manufacturing sector became a driving force for export-led industrialization. Such expansion absorbs considerable foreign exchange earnings and provides good investment opportunities. New economic policy is adopted and gradually switches off from the import-substituting strategy. The model therefore, tries to explain the direction and magnitude of export-output growth; 3) In order to have better understanding of export composition, the model provides alternative choice for export aggregates. The relevance of choosing optimal export aggregates is determined by the non-nested regression test. A reasonable production function is therefore as follows:

$$\Delta Y = f(\Delta K, \Delta LAB, \Delta G, \Delta NOEX, \Delta NOIM, \Delta R) \tag{3.17}$$

where ΔY is real GDP; ΔK is capital; ΔLAB is labour force; ΔG is real government expenditure; $\Delta NOEX$ is non-oil real exports; $\Delta NOIM$ is real imports and ΔR is real exchange rate. The time series are in logarithmic form. Y, G, NOEX, NOIM, R are transformed to real variables by CPI deflator. NOEX and NOIM are extracted from the Balance of Payments Statistics (BOP), whereas R, Y, LAB and G are from the International Financial Statistics (IFS), International Monetary Fund, various issues.[8] Quarterly data are used covering from 1974Q1 to 1993Q4. Since quarterly data are not available for Y, G (1988Q3 - 1988Q4), and NOEX and NOIM (1974Q1 - 1975Q4), interpolation technique is used for obtaining the appropriate data. We adopt Goldstein and Khan's (1976) interpolation method by fitting a quadratic curve to three successive annual observations.[9]

Eq. 3.17 shows that the change of real gross domestic product (ΔY) is a function of capital (ΔK), labour force (ΔLAB), government expenditure (ΔG), non-oil real exports (ΔNOEX), real imports (ΔNOIM), and real exchange rate (ΔR).

Since it is difficult to quantify the amount of capital inputs (ΔK), the problem of using capital stock is solved by using investment-to-output(I/Y) ratio, where I stands for investment.[10] As shown by other researchers, population is used as a proxy for total labour force because the data is difficult to be found in the developing countries (Ram, 1987). The inclusion of government expenditure (ΔG) is to capture traditional Keynesian effects that the role of government expenditure may stimulate the exports through a rise in national income.

The "Dutch Disease" effect actually depressed the development of non-oil sector. The sequential of exchange rate devaluations and the trade and investment reforms provided opportunities for non-oil sector growth in the eighties. The development of non-oil sector alleviated income instability due to oil price fluctuation. It was the government strategy to reduce dependence on oil-exporting sector. Therefore, ΔNOEX is to capture the pure effects of manufacturing sectors to economic growth.

The variable of ΔNOIM is to test the possibility of export externality effects. Export causes an increase in national income, which subsequently increases demand for imports. Neoclassical theory states that possible export externality effects will offset the side effect of import growth; increases specialization and competitiveness of the export sector and ultimately render economic growth and relieve foreign borrowing constraint (see Serletis, 1992a).

Real exchange rate is defined as the quantity of foreign goods that can be obtained in exchange for one domestic good. The nominal exchange rate is the value of rupiahs per US dollar, *per se*. A real devaluation reduces relative price of exported to imported goods, which makes exported goods cheaper in the international market. Except the imports variable, we expect that the variables at the right hand size of Eq. 3.17 are positively related to output growth. The model specification is as follows:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{i1}(L)\Delta Y_t + \sum_{i=0}^{n} \alpha_{i2}(L)(I/Y)_t + \sum_{i=0}^{n} \alpha_{i3}(L)\Delta LAB_t + \sum_{i=0}^{n} \alpha_{i4}(L)\Delta G_t$$
$$+ \sum_{i=0}^{n} \alpha_{i5}(L)\Delta NOEX_t + \sum_{i=0}^{n} \alpha_{i6}(L)\Delta NOIM_t + \sum_{i=0}^{n} \alpha_{i7}(L)\Delta R_t + trend + seasonal + e_t \tag{3.18}$$

Eq. 3.18 presents an autoregressive Distributed Lags (ADL) model by the use of Ordinary Least Square (OLS) technique. The equation includes lags of dependent variable (ΔY), a trend and seasonal dummies. We use the general-to-specific approach to obtain the parsimonious equation. (L) is the lag operator. The residual term e_t is assumed to be independent and identically distributed, i.e. $e_t \sim N(0,\varepsilon^2)$. Each series is initially given to 4 lags and subsequently eliminated the least insignificant variable from the equation. Eq. 3.18 shows a production relation between output growth and other explanatory variables. In fact, the relationship is not an accounting identity. Exports are a part of national income in accounting sense. As Balassa (1978) and Ram (1985) indicate that Eq. 3.17 and Eq. 3.18 present a production relation which does not have the national income accounting identity pattern for the total output.

Export aggregates can also be measured as the change of non-oil export to total export share, i.e. Δ(NOEX/EXTOT), where EXTOT is the total sum of oil exports and non-oil exports. Sheehey (1990, 1992) argues that there is a direct built-in correlation between GDP and exports. Using the rate of change of non-exports to total exports share prevents the bias from regressing GDP against export growth. We substitute ΔNOEX in Eq. 3.18 by Δ(NOEX/EXTOT) and the model specification is:

$$\Delta Y_t = \alpha_t + \sum_{i=1}^{n} \alpha_{i1}(L)\Delta Y_t + \sum_{i=0}^{n} \alpha_{i2}(L)(I/Y)_t + \sum_{i=0}^{n} \alpha_{i3}(L)\Delta LAB_t + \sum_{i=0}^{n} \alpha_{i4}(L)\Delta G_t + \sum_{i=0}^{n} \alpha_{i5}(L)\Delta EXRATIO_t$$
$$+ \sum_{i=0}^{n} \alpha_{i5}(L)\Delta NOIM_t + \sum_{i=0}^{n} \alpha_{i7}(L)\Delta R_t + trend + seasonal + e_t \tag{3.19}$$

where ΔEXRATIO is Δ(NOEX/EXTOT).

3.3.2 Non-Nested Regression Test

Eq. 3.18 and Eq. 3.19 show two kinds of export aggregates. The choice of export aggregates can be determined by the non-nested regression technique which tests for two rival models i.e. Model 1 (M1) (Eq. 3.18) versus Model 2 (M2) (Eq. 3.19). Assuming that there are two models M1 and M2 and they are true. The hypothesis we test is:

H_1: model M1 is true,

H_2: model M2 is true.

If H_1 and H_2 do not make up together a set of admissible hypothesis, that is, neither one is a special case of the other, then the hypothesis of H_1 and H_2 is the non-nested hypothesis. The model is called the non-nested model. The art of the hypothesis is to estimate whether the null is rejected in favour of the alternative, or vice versa.

The dependent variable of the two models are common, that is, ΔY. Model M1 is obtained from Eq. 3.18 and model M2 from Eq. 3.19. In order to confirm the rival models, we construct the non-nested test by simulation. The number of replications is 10,000.

3.3.3 Empirical Results

Table 3.9 reports the empirical results of Eq. 3.18. Each explanatory variable is initially set to 4 lags and the least significant term is dropped each time by the application of the general-to-specific approach. Table 3.9 shows the parsimonious equation of economic growth against investment-to-income ratio, labour growth, growth of government expenditure, non-oil export growth, import growth and the change of real exchange rate.

The parameters of the variables indicate a 5 percent statistical significance. The equation shows that the lagged terms of dependent variable ΔY contribute to economic growth. The coefficient of investment-income ratio (I/Y), though small, still contributes to economic growth. The result echoes to

Sundrum's (1991) studies that a positive I/Y ratio is also found in Taiwan. The total effects of labour inputs are negative. This can be argued that the initial placement of the new urban migrants is in the informal sector of the economy or services rather than in industries. The transfer of labour from rural areas to the cities does not necessarily lead to higher growth of output (Syrquin, 1989; Yaghmaian, 1994). The real government expenditure (ΔG) shows a positive relation to economic growth. The total effect is about 0.12. That is to say, a 10% rise in budgetary growth results to about 1.2% in GDP growth. It was not surprising because the Indonesian government played a very active role in promoting investment climate, implementing trade and economic reforms in the early eighties. As Ram comments that "it is difficult to adapt Feder's model to such an increase in the number of 'sectors', but the conventional model can be augmented, like ΔG, to add another 'input' provided the number of observations is adequate" (1987, p.62-63).

The coefficient of ΔNOEX is the export elasticity demand to economic growth (ΔY). The effect of non-oil export growth (ΔNOEX) on GDP growth (ΔY) is 0.088, implying that a 10% increase in non-oil exports growth generates a 0.88% increase of GDP growth. The export elasticity of demand to output growth therefore is inelastic. This reflects a phenomenon that in the process of industrialization, the value added of the manufactured products is relatively lower than goods produced in the developed countries. The import growth (ΔNOIM) shows export externality effect on (ΔY), where economic growth further simulates higher imported demand for intermediate and final goods in the domestic market. The change of exchange rate (ΔR) has a positive effect on economic growth. A 10% change in real exchange rate depreciation will boost the economic growth by 0.14%.

In order to check for parameter constancy, the last four quarter (1993Q1 to 1993Q4) is used for dynamic forecasts. The prediction errors are small and there are not sign of statistical significance reported.

In order to understand the influence of non-oil exports to economic expansion, a variable, ΔEXRATIO, is used to indicate the ratio change of non-oil exports (NOEX) to total export Δ(NOEX/EXTOT). Total exports (EXTOT) are the sum of non-oil exports and oil exports. Severn (1968) suggests that this ratio can be described as an "openness coefficient" which measures the degree of openness of an economy. Table 3.10 shows that ΔY is determined by the change of its lag terms, I/Y, ΔLAB, ΔG, ΔEXRATIO, ΔNOIM, ΔR, and seasonal factors. The total effect of ΔEXRATIO on ΔY is 0.7476. The positive sign of the ratio can be explained by the fact that the non-oil exports growth becomes a driving force to economic growth. The size of ΔNOIM is negatively related to GDP growth. Increase imports lead to a reduction in growth. Moreover, I/Y and ΔR also show positive impacts. The latter vindicates that a depreciation policy may trigger higher economic growth in the short run. Given a dynamic forecast, the model shows the minimal prediction errors.

Eqs. 3.11 and 3.12 provide explanatory power of exports - economic growth. In order to choose a better equation, a non-nested regression technique is applied for choosing the rival models. Table 3.11 shows the alternative tests for non-nested regression models. Model 1 (M1) is derived from the result of Table 3.9 and model 2 (M2) from Table 3.10. Using various statistical tests, the null hypotheses (M1 against M2) are mostly rejected. Moreover, based on Akaike's information criterion, the result is in favour of M2. Therefore, M2 outweighs M1 and it is a better model to explain the relationship between the non-oil export growth and the GDP growth. Hence, using ΔEXRATIO as the export-explanatory variable is reaffirmed.

3.4 The Issue of Interpolation

In the previous section, statistical results are reported by using quarterly data. Whereas quarterly data may be unavailable to some series, such as GDP, the method of interpolation is applied. Interpolation is used to compute the approximate value of a function, given its values at a set of points. However, the major problem of interpolation of quarterly data is that the statistical errors will understate the true degree of uncertainty about the parameter values. To reflect the true degree of the statistical results that reported earlier, we re-run the models with annual data. Since some data are not available in the earlier years, the sample size is chosen from 1976 to 1993.

Regarding the balance-of-payment constrained model, it states that in the long run, a country's growth rate of real income is equal to the real income growth rate, which is consistent with current account balance. Table 3.12 reports the long run relationship of non-oil real exports and real income by using the Johansen maximum likelihood cointegration tests. The maximum lag is set to two, which is determined by Schwert's optimal lag criteria (1987). We use the Johansen trace statistic[11] which has been corrected for small sample bias (Reimers, 1992). Therefore, we use (T-nk) instead of T in the log-likelihood ratio statistic for trace test. The Table shows that at least one cointegrated vector is found for the non-oil real exports and real income. The two variables will move together in the long run which is in line to the balance-of-payment constrained model mentioned in the previous section. We do not perform the tests for sub-sample periods as each sub-sample is too short for regression.

We then test the neoclassical approach by running the following equations:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{i1}(L)\Delta Y_t + \sum_{i=0}^{n} \alpha_{i2}(L)(I/Y)_t + \sum_{i=0}^{n} \alpha_{i3}(L)\Delta LAB_t + \sum_{i=0}^{n} \alpha_{i4}(L)\Delta G_t$$

$$+ \sum_{i=0}^{n} \alpha_{i5}(L)\Delta NOEX_t + \sum_{i=0}^{n} \alpha_{i6}(L)\Delta NOIM_t + \sum_{i=0}^{n} \alpha_{i7}(L)\Delta R_t + e_t \tag{3.20}$$

and

$$\Delta Y_t = \alpha_t + \sum_{i=1}^{n} \alpha_{i1}(L)\Delta Y_t + \sum_{i=0}^{n} \alpha_{i2}(L)(I/Y)_t + \sum_{i=0}^{n} \alpha_{i3}(L)\Delta LAB_t + \sum_{i=0}^{n} \alpha_{i4}(L)\Delta G_t + \sum_{i=0}^{n} \alpha_{i5}(L)\Delta EXRATIO_t$$

$$+ \sum_{i=0}^{n} \alpha_{i5}(L)\Delta NOIM_t + \sum_{i=0}^{n} \alpha_{i7}(L)\Delta R_t + e_t \tag{3.21}$$

where ΔEXRATIO is Δ(NOEX/EXTOT).

Eqs. 3.20 and 3.21 are similar to those of Eqs. 3.18 and 3.19. The general-to-specific approach is used to obtain the parsimonious equations. The initial lag is set to 1 in order to capture the maximum degree of freedom. All the variables are in real term.

Table 3.13 shows the parsimonious equation of economic growth against its own growth, export and import growth, growth of government expenditure, exchange rate changes, labour growth and investment-to-income ratio. The non-oil exports and import growth show positive signs. The coefficient of ΔNOEX is the export elasticity demand to economic growth, ΔY. The overall export elasticity of ΔNOEX on ΔY is inelastic, which is a typical export function of a developing country. The value-added of the manufacturing products is relatively lower than goods produced in a developed country. Moreover, the overall effects of ΔNOIM indicate the export externality effect on ΔY, in which economic growth further simulates higher imported demand for intermediate and final goods in the domestic market. The overall impact of non-oil export and import growth to economic growth is as the same as those with quarterly data.

The positive size of government expenditure confirms the role of government played in the process of economic development. Both ΔR and ΔLAB show negative signs. The change of real exchange rate indicates that depreciation is not necessary to stimulate non-oil export growth especially in the short run. This might be due to the sticky price effects and the slow reaction of goods market. The negative effect of labour-to-economic growth also indicates the fact that a large pool of labour supply is not a condition for economic growth. Human capital deepening is a long-term solution to upgrade the quality and the skills of labour. On the whole, the results are quite similar to those in Table 3.9 except the variable I/Y that shows a negative sign.

The use of ΔEXRATIO, an alternative to ΔNOEX, is reported in Table 3.14. The ratio is described as "openness coefficient" which measures the degree of openness in an economy. Generally speaking, the number of variables in smaller than those in Table 3.10. The non-oil export, import growth and growth of government expenditure all show positive sign. On the other hand, ΔR and I/Y do not have correct signs. In order to choose a better equation, Table 3.15 reports the alternative tests for non-nested regression models. The overwhelming results are in favour of model M1 (ΔNOEX) against M2 (ΔEXRATIO). That is, using ΔNOEX in M1 provides better statistical analysis in interpreting the export-income growth model. The result is opposite to Table 3.11 where ΔEXRATIO is a better explanatory variable in model selection. The choice of export aggregates for model selection therefore remains inconclusive.

3.5 Conclusion

The chapter shows the relationship between export and economic growth. Trade liberalization fosters the development of manufacturing export sector in Indonesia. The balance-of-payment constrained growth model and the neoclassical model are investigated. The paper is to test the validity of the assumptions in the specification of export-economic growth and to measure the effects of export growth to economic expansion.

The assumptions of balance-of-payment constrained growth model are first tested. The model states that in the long run, a country's growth rate of real income is equal to the real income growth rate, which is consistent with current account balance. The growth model is tested by Johansen's cointegration technique. The model is divided into 2 sub-sample periods: 1974Q1-1983Q1 and 1983Q2-1993Q4. Except one sub-sample period, the overall results are in favour of one cointegration in the various alternative sample periods. The implications show that in the long run real exports and real income in Indonesia are expected to move together over time. The simple policy conclusion is that if the government wish to grow faster they must first raise the balance-of-payments constraint on demand. If the balance-of-payments equilibrium growth rate can be raised by making exports more attractive and by reducing the income elasticity of demand for imports, demand can be expanded without producing balance-of-payments difficulties. Hence the empirical evidence of the balance-of-payment constrained model is in support to the advocates of export-led growth.

Meanwhile, we relax the neoclassical theory by including "unconventional variables" in the model. The dependence on oil-related production in Indonesia was traditionally an economic pillar for government revenue and output growth. The trade and investment reforms speed up the development of export sectors. The expanded model is to explain the magnitude of export-output growth. The explanatory variables such as I/Y, rate of government expenditure, labour force, non-exports, imports and exchange rate are accountable to output growth. Two alternative equations are tested and the main difference is due to the choice of export aggregates. Using the general-to-specific approach as well as the non-nested regression test, we confirm the use of the ratio change of non-exports to total exports

(ΔEXRATIO) than the rate of export change (ΔNOEX) as the export variable. The model also shows that real government expenditure growth, (ΔG), investment to income ratio (I/Y), labour force (ΔLAB), imports (ΔNOIM), and real exchange rate (ΔR) are the important factors for determining the size of output growth.

The issue of interpolation may vary the statistical results when quarterly data, instead of annual data, is used to estimate the models. In the last section, therefore, reports the models with annul data. For the balance-of-payment constrained model, a long run cointegrating relationship is also found between non-oil real exports and real income. The same results are recorded. In the "expanded" model of neoclassical growth theory, similar statistical results are also found, except the fact that the choice of export aggregates for model selection remains inconclusive. On the whole, the non-oil exports growth (ΔNOEX) has a positive size, and confirms the support of export-income growth synthesis.

The above two models give an account of export-output growth for the Indonesian economy. Trade liberalization in the eighties fostered the growth in the non-export sector. The arguments are supported by Shepherd[12] & *at. el.* (1998), as they prove that Indonesia experienced considerable increase in manufacturing output and productivity in the mid-1980. On the other hand, the causation effect between non-oil exports and economic growth is still unknown. The issue of causality therefore, will be discussed in the next chapter.

Appendix

Issues on Export-Led Growth Hypothesis

Export-led trade strategy becomes an exemplary advocate for economic growth in the developing countries. Economic recession as well as debt crisis in the eighties enforced those countries to reassess their long-term economic growth strategies. Debt crisis in the Latin America compared with high economic growth in the East Asia have caused countries to reconsider the import-substitution (IS) approach to economic growth. A belief of export promoting (EP) trade to revitalize economic growth refreshed the advocate of export optimists. Table A3.1 shows the average annual growth rates of GDP and merchandise exports in different regions. Countries in East Asia demonstrated highest average annual output growth and export growth since 1974. The immediate aftermath of oil crisis in 1973 revealed that, many countries had suffered from negative merchandise exports growth. Even though economic recession occurred in the early eighties, countries in the Asia-Pacific region still maintained a two-digit economic growth throughout the whole decade (except 1982 and 1985). No other parts of the world are comparable to the Pacific region's high output and export growth.

The employment of export promoting or export-led growth strategy to economic growth may raise questions in line with import-substitutionstrategy. First of all, what are the definitions of EP and IS? According to Bhagwati (1990), the use of effective exchange rate is to measure the incentives of trade strategy. The export effective exchange rate (EER_x) and the import effective exchange rate (EER_m) are to assess the degree of export and import-substitution. He says that "EER_x would include, for a peso-currency country, not just the pesos earned at parity form a unit dollar's worth of export, but also any export subsidy, tax credits, special credits, etc. Similarly, EER_m would add to the parity any import duty, import premia resulting from quantitative restrictions (QRs) and other charges." He suggests the following terminology to delineate trade strategy (p.18):

IS strategy:	$EER_x < EER_m$
EP strategy:	$EER_x = EER_m$
Ultra-EP strategy:	$EER_x > EER_m$

If a country's effective exchange rate of export is less than the effective exchange rate of import ($EER_x < EER_m$), it implies an IS strategy which is called 'a bias against exports'. A country of which $EER_x = EER_m$ is called the EP strategy because the bias against exports is eliminated and the home producer will expand their exportables. The ultra-EP strategy ($EER_x > EER_m$) is defined as a country's highly successful trade direction and it is closer to trade-neutral strategy than to a bias towards exports. Bhagwati argues that "the sequencing of trade regimes, one in which the EP countries went from an IS strategy to a neutral strategy which eliminated the bias against exports, and thereby improved their export performance, prompted the researchers to define EP strategy in terms of neutrality" (p.18).

Greenaway and Nam (1988) argue that it is difficult to clearly define the EP and IS strategies. Industries nowadays are very homogenous in nature and the products are highly diversified. Greenaway and Miller (1986) state that an industry may export and import the same commodity due to the development of intra-industry trade. Bhagwati (1986) therefore argues that the definition is on average incentives. It is true that a country's EER_m can outweigh EER_x, even though it relies on EP strategy. It is possible to have an import substituting in some sectors under EP or ultra-EP strategy. However, he warns that "one should not jump to the erroneous conclusion that there is therefore no way to think of EP versus IS and that the definition is an artificial one" (p.93). Greenaway (1986) makes four categories of trade strategies. They are:

i) *Strong outward-oriented* - Non-existence or very low trade controls and the export and import exchange rates are more or less equal.

ii) *Moderately outward-oriented* - Relatively low effective protection rate and limited use of trade control, *etc.*. The import exchange rate is merely higher than the export exchange rate.

iii) *Moderately inward-oriented* - Relatively high effective protection rate and a bias for exports. Exchange rate is overvalued.

iv) *Strongly inward-oriented* - Very high level of effective protection rate with a series of stringent trade control. Exchange rate is highly overvalued.

In their article, Greenaway and Nam (1988) summarize the orientation of trade strategy for 41 countries in two periods, 1963-73 and 1973-84. We reproduce the composition of country groups in Table A3.2. Regarding the East Asian countries like Korea, Singapore and Hong Kong, they all fall into the strongly outward-oriented category. It confirms that the export-led hypothesis is the engine of economic growth for these "Little Dragons". Malaysia and the Philippines remain in the moderately outward-oriented and moderately inward-oriented categories respectively. However, Indonesia has changed her status from the moderately outward-oriented in 1965-73 to moderately inward-oriented strategy in 1973-84. A more defensive trade policy has been carried out. The Table also shows that most of the African and Latin American countries adopt the inward-looking trade strategy (IS) which is in contrast to their counterparts in the East Asia.

Hirschman (1968) asserts that "motivation driven to IS are bolstered by external conditions. The decline in export earnings of primary products in depression periods and a high degree of direct investment to 'transfer' resources by transnational corporations (TNCs) (Kirkpatrick and Nixson 1983) intensify LDCs' inclination for IS strategy". For brevity, the orthodox arguments for IS are:

1) Overall degree of protection for the economy, that is, the effective rate of protection (ERP) or domestic resource cost (DRC);

2) Excessive high wages in an economy that the EP strategy is not appropriate;

3) The infant industry protection and the optimum tariff arguments;

4) The use of direct control and exchange rate alignment, which can protect manufactured goods from intense international competition (Corden 1974, 1984a, Fields 1984, Krueger 1978, 1984, Greenaway 1986).

The East Asia countries in the fifties and sixties were facing scanty infrastructure, inadequate physical and financial capital and semi- or unskilled labour. Importations of technology and managerial skills have increased the cost of protection of home products, which make them unattractive to the world market. It is typical the infant industry arguments (Evans 1990).

The general high domestic costs of IS strategy has fortified the neoclassical synthesis to implement EP policies. Neoclassical theorists accepts the principle of comparative advantages as the defence for international free trade.[13] The principles allow better resource allocation, greater use of capacity utilization, permit the exploitation of economies of scale through competition and marketing know-how, and improve technological standard (Balassa and Associates, 1971; Greenaway and Milner 1987; Lal 1983; Keesing and Lall 1992). Moreover, Krueger (1990) explains that "an export-oriented set of policies could be no more than the absence of policies that discriminate in favour of sales in the domestic market. The criterion for optimal allocation of resources is that the marginal rate of transformation of domestic production should equal the international marginal rate of transformation, in the absence of monopoly power in trade". Their proponents are fully reflected by rapid expansion of near full employment, income distribution and economic growth in the East Asia (Ranis 1985). Therefore, policy reorientation of some Asian countries has been embarked since the sixties; Singapore in mid-sixties, Malaysia, Thailand in the late sixties, and Indonesia in the early eighties. According to Ariff and Hill (1985, p.15), the reasons for switching to export-oriented strategy of the Asean countries are:

1) Poor record of import substitution - the IS policy fails to generate high manufacturing output and employment growth, nor does import replacement spill over into export sector;
2) Earlier achievement of Singapore attaining high export and employment growth actually encourages other countries to follow to;
3) NICs' spectacular growth in manufactured goods, mostly labour-intensive kind, is not parallel in economic development;
4) Change of international environment towards greater emphasis on exports and the massive studies on outward-oriented strategy by international organization, namely, the Organization for Economic Cooperation and Development (OCED) and the National Bureau of Economic Research (NBER) in the seventies;
5) Structural change in the industrialised countries like Japan, has contributed to the relocation of many industries to the developing countries. Economic restructuring has slowed down Japanese economic growth, increased raw material prices and appreciated the yen in 1970s. The loss of

comparative advantage in textile products forced Japanese firms to relocate to the NICs (Yamazawa 1980).

However, the neoclassical theorists fail to explain the role of government intervention to a country's economic growth. The economic success of the 'Four Little Dragons', except Hong Kong, is heavily dependent on direct government planning and regulation, and thus to increase their international competitiveness. Guisinger (1980) states that government policies should aim for a competitive market environment, encouraging small scale industry, regional dispersal, equity, employment creation, increasing foreign earnings, technology transfer and foreign investment. Kirkpatick (1987) states that "in the case of the Republic of Korea and Taiwan, both import controls and export incentive controls have been used to pursue a strategy based on selective import substitution and export promotion, with IS being used to develop local manufacturing capacity as a basis for subsequent export activities".

Issues on Human Capital and Education to Economic Growth

Traditional neoclassical theory plays no role in explaining human capital and education to economic growth. The inclusion of human capital to new growth theory may be either through (i) educated labour as a factor input or, (ii) by capital human accumulation via research and development. In the first case, human capital investment rate determines the rate of economic growth. This will have a direct link between government expenditure on education and growth. In the latter case, economic growth is generated from the rate of physical investment through direct human capital involvement in research and development (R & D) and in technology transfer. In the new growth model, there is a positive relationship between physical and human capital investment and income growth. Higher economic growth can be achieved by higher physical and human investment rate, faster growth in labour force and a higher degree of technology transfer.

Barro and Sala-i-Martin (1995) show that education attainment and the level of education proved to have significant effects on income growth. They also confirm that there is a positive relationship between public expenditure on education and the overall economic performance. In regard to economic growth of East Asian economies, such as Singapore and Hong Kong, Young (1992) shows that it is the educational investment contributed to human capital accumulation, rather than the acquisition of technologies to make factors more productive. Frankel *& et.al*, (1996), however, make a counter argument for Young's results. By examining the trade-led growth for East Asian countries, they conclude that it is openness, not factor accumulation, is the dominant explanation, apparently accounting for more of the growth miracle than investment and schooling combined. Whilst there is a belief that human capital investment is positively linked to higher income levels, the robustness of the empirical results and the direction of causality remain uncertain (Gemmell, 1998). He argues that "drawing policy conclusions from this is, however, extremely hazardous. It remains unclear which types of levels of education are most important and whether this differs across countries. Most studies have also been unconcerned with the relative importance for growth of education compared with other determinants such as investment in physical capital".

Other things being equal, export-led growth theory is among one of the hottest issues for policy making in developing countries. Export growth can relieve the balance of payment constraint, by making exports more attractive and by reducing the income elasticity demand of imports. Demand will then generate its own supply by encouraging investment, absorbing unemployment and raising productivity growth. Moreover, competition between export and non-export sectors for the use of economic resources will make the former generate positive externalities to non-export sectors, through technology transfer and efficient resource allocation. Evidence shows that there is a directional causality for export-economic growth. Edwards (1993) and Frankel *& et. al.* (1996) conclude that while other variables, such as investment, education and technological catch-up contribute to the growth of national income, but certainly openness to trade plays a substantial role in many developing countries. What's more, export-led growth has its ability to set up virtuous cycle for growth. Krishna *& et. al.* (1998) provide statistical evidence that GDP growth with higher trade exposure is better modelled by including an index of global business cycle conditions.

Notes

1. Indonesia's early economic development (1960-1980) can refer to Arndt (1977, 1978a, 1978b); Booth and McCawley (1981), Dick (1979); Drake (1989) and Gillis (1984).

2. The consequences and measures of trade and investment reforms may refer to Booth (1988); Hill (1990a, 1990b, 1990c); Hobohm (1987); MacIntyre (1992); Nasution (1991); Sjahrir and Brown (1992).

3. The definition is cited from the United Nations Industrial Development Organization (UNIDO), (1993).

4. Roepstorff excluded China and Taiwan for calculation.

5. The definition is cited from the United Nations Industrial Development Organization (UNIDO), (1993).

6. List of investment reform can be found in Table 3.2.

7. Feder's export-led equation is as follows:

$$(\Delta Y/Y) = \underset{(0.180)}{0.002} + \underset{(3.542)}{0.178(I/Y)} + \underset{(2.862)}{0.747(\Delta L/L)} + \underset{(5.454)}{0.422(X/Y)(\Delta X/X)}$$

where t-ratios are in parentheses.

8. The description code of each variable is as follows:

variable	code	source
NOEX	1AADXQ	BOP
NOIM	1ABDXQ	BOP
R	RFZF	IFS
G	82ZF	IFS
Y	99BZF	IFS
LAB	99ZZF	IFS
CPI	64ZF	IFS

9. According to Goldstein and Khan, three successive annual observations (x_{t-1}, x_t, x_{t+1}) can be interpolated as follows:

$$\int_0^1 (iy^2 + jy + k)\, dy = x_{t-1}$$

$$\int_1^2 (iy^2 + jy + k)\, dy = x_t$$

$$\int_2^3 (iy^2 + jy + k)\, dy = x_{t+1}$$

Taking integration and solving for i, j and k:

$i = 0.5x_{t-1} - x_t + 0.5x_{t+1}$

$j = -2x_{t-1} + 3x_t - x_{t+1}$

$k = 1.8333x_{t-1} - 1.1666x_t + 0.333x_{t+1}$

Therefore, the four interpolated quarterly observations (Q1, Q2, Q3 Q4) are:

$$Q1 = \int_{1}^{1.25} (iy^2 + jy + k)\, dy = 0.0548\, x_{t-1} + 0.2343\, x_t - 0.0390\, x_{t+1}$$

$$Q2 = \int_{1.25}^{1.5} (iy^2 + jy + k)\, dy = 0.0079\, x_{t-1} + 0.2655\, x_t - 0.024\, x_{t+1}$$

$$Q3 = \int_{1.5}^{1.75} (iy^2 + jy + k)\, dy = -0.0233\, x_{t-1} + 0.2652\, x_t + 0.008\, x_{t+1}$$

$$Q4 = \int_{1.75}^{2} (iy^2 + jy + k)\, dy = -0.0392\, x_{t-1} + 0.2347\, x_t + 0.0545\, x_{t+1}$$

10. The data of investment is extracted from Balance of Payment Statistics, IMF, code number 3YXD4Q.

11. The trace statistic is to be more robust to non-normality of errors compared to the maximal eigenvalue statistic (Cheung and Lai, 1993).

12. In their paper, Shepherd *& at.el.* compare Indonesian manufacturing sector output productivity with Australian's. They find that Indonesia experienced considerable catch-up on Australian manufacturing sector labour productivity levels, mainly from mid- 1980s. These trends suggest an improving competitive advantage for Indonesian manufacturing *vis-a-vis* Australia just as both countries were committing themselves to the APEC process of trade liberalization in the early 1990s.

13. The mainstream of neoclassical paradigm to economic development is summarized in Hunt (1989, p.32-33).

Table 3.1 Principal Import Barriers by SITC Section (1980)

	SITC Section								
Import Barrier	Food, Live Animals (SITC[d] 0)	Beverage, Tobacco (SITC 1)	Crude Materials (SITC 2)	Mineral Fuels (SITC 3)	Animal, Vegetable Oil, Fats (SITC 4)	Chemicals (SITC 5)	Basic Manufactures (SITC 6)	Machines, Transport Equipment (SITC 7)	Misc. Macfactured Goods (SITC 8)
Tariffs (levels, %)[a]									
Average Ad Valorem Rates	44.0	49.2	18.1	6.3	28.1	18.9	36.8	26.7	49.8
	(76.0)	(69.2)	(100.0)	(100.0)	(100.0)	(99.9)	(95.4)	(99.0)	(81.6)
AS[b] Preference Rates	11.8	0.0	12.6	17.1	12.6	13.8	12.8	10.5	11.8
	(7.5)	(0.0)	(14.8)	(12.1)	(35.9)	(21.2)	(11.4)	(12.8)	(2.2)
Specific Tariffs	(24.0)	(30.8)	(0.0)	(0.0)	(0.0)	(0.1)	(4.6)	(0.3)	(18.4)
NTBs[c] (Frequency, %)									
Sales Taxes	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.2	100.0
Restictive Licensing	0.1	0.0	6.0	1.7	0.0	6.8	16.6	15.3	1.3
Quotas	0.0	0.0	0.0	0.0	0.0	0.5	2.5	0.7	0.0
Prohibitions	29.0	9.6	8.6	0.0	3.1	0.0	0.2	0.0	1.4
State Trading Monopolies	3.2	0.0	0.6	1.7	0.0	0.0	0.0	0.0	0.0

[a] Tariff-related values in parentheses are frequency ratios expressed as percentages.
[b] AS = ASEAN preference scheme.
[c] NTBs = Non-tariff barriers.
[d] SITC = Standard International Trade Classification.
Source: DeRosa, D.A. (1986)

Table 3.2 Trade and Investment Reforms

Reform	Main Contents	Effects
TRADE and SHIPPING		
1985, March Tariff Rationalization	- Range reduction from 0-225% to 0-60% - Number of tariff levels reduced from 25 to 11	- Some reduction in protection
1985, April Customs Reform (INPRES No.4)	- Removal of Customs Dept. in goods clearance - Appointment of private surveyor SGS - Removal of restrictions on choice on international carrier	- Reduced subs. average time of imports and exports clearance - Important psychological effect
1986, May (PAKEM)	- Duty drawback and bypass monopoly - Arms-length transactions and computerised processing	- Improve duty drawback process and important factor to increase exports
1986, October	- Some change from import licensing to general imports - Phasing down of NTB with some increase in tariff to offset - Reduction in tariff needed in production	- Improved investment climate - Increased investment, especially export oriented
1987, January	- Some change from import licensing to general imports	
1987, July Simplification of Textile Quota	- Transparency of allocation - Some allocation to newcomers and small scale	- Some improvements although now some complaints
1988, November (PAKNOP)	- Removal of import monopolies: plastic and steel - Inter-island shipping deregulation	
1990, May	- Further removal of NTB to tariff - Deregulation pharmaceutical and animal husbandry	- Improve investment climate
INVESTMENT		
1986, May (PAKEM)	- 95% foreign ownership possible for export oriented foreign investments - Export oriented firms allowed to distribute domestically - Joint ventures can participate in government export credit scheme	- Improve investment climate and encourage export or investments
1987, July	- Deregulation of investment & capacity licensing - Broad Banding - Closed sector open to export of firms	- Improve investment climate
1988, November	- Joint ventures allowed to distribute own products domestically	
1989, May	- Removal of Priority Scale List for investment through Board of Investment - Introduction of Negative List	- Improve investment climate and ease investment application
PRIVATIZATION		
1989, June	- Categorization of state enterprise by soundness - Alternatives in privatization: go public joint venture and management, merger etc.	- No effect yet

Source: Anwar & *et. al.* (1991)

Table 3.3 A Summary of Trade Statistics[a]

Item	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
External Trade														
Exports, fob	7102	23951	25615	22328	21146	21888	18586	14806	17136	19219	22159	25675	29142	33966
Imports, cif	4770	10835	13272	16859	16352	13882	10260	10718	12370	13248	16360	21837	25869	27279
Trade Balance	2332	13116	11893	5469	4794	8006	8326	4088	4766	5971	5799	3838	3273	6687
Exports, by SITC														
Food & live animals	368	1291	929	905	1093	1368	1383	1774	1684	2001	2073	2293	2539	2469
Beverage & tobacco	36	61	54	42	48	44	49	69	72	69	115	136	154	218
Crude materials excl. fuels	1055	3569	2208	1581	1650	1762	1403	1473	1926	2661	1885	1969	2373	2625
Minerals fuels, etc.	5311	17785	20669	18408	16153	16045	12757	8310	8582	7723	8760	11239	11170	11273
Animals, vegetable oil & fats	160	285	129	133	149	175	414	166	290	540	458	420	562	762
Chemcials	24	84	64	61	119	170	210	260	251	346	489	621	853	795
Basic manufactures	92	615	777	817	1350	1565	1804	1984	3267	4281	6176	5644	6489	8434
Machines, transport equip't	32	109	154	180	133	223	98	63	57	126	196	367	668	1448
Misc. manufactured goods	21	120	121	141	213	372	437	678	732	1154	1748	2864	4189	5790
Unclassified goods	3	32	60	59	238	164	31	29	275	318	259	122	145	152
Imports, by SITC														
Food & live animals	577	1285	1356	1074	1135	676	556	610	624	642	911	852	1061	1274
Beverage & tobacco	15	42	45	51	28	29	21	28	33	34	34	54	74	89
Crude materials excl. fuels	162	491	565	609	676	883	729	830	990	1205	1674	1885	2151	2409
Minerals fuels, etc.	257	1754	1727	3550	4150	2705	1288	1107	1144	959	1253	1937	2323	2104
Animals, vegetable oil & fats	3	9	29	13	12	52	36	18	97	177	151	25	41	149
Chemcials	808	1255	1754	1804	1893	2137	1917	1910	2326	2541	2873	3394	3432	3776
Basic manufactures	1074	2053	2518	2732	2352	1885	1718	1668	1785	2062	2638	3553	4139	4668
Machines, transport equip't	1773	3634	4619	6260	5684	5037	3618	4117	4819	5096	6182	9328	11631	11700
Misc. manufactured goods	100	285	325	376	359	379	331	389	469	451	634	797	980	1110
Unclassified goods	1	27	334	390	65	99	46	41	83	81	10	12	17	–

cont'd

Item	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Direction of Trade														
Exports, Total	7720.6	21909.4	23810.3	22328.9	21146.3	21881.1	18596.5	14808.5	17169.7	19375.8	21936.2	25675.2	29135.2	33937.0
Japan	3131.8	10792.5	11415.8	11192.6	9678.2	10352.5	8593.5	6644.1	7393.3	8087.5	9252.4	10923.4	10766.9	10760.5
United States	1865.5	4303.4	4360.4	3546.0	4266.7	4504.7	4040.2	2901.5	3348.7	3138.2	3474.9	3364.4	3508.5	4419.1
Singapore	632.7	2483.7	2320.4	3120.9	3127.9	2125.5	1625.6	1238.9	1449.3	1655.8	1809.1	1902.1	2409.8	3313.5
Korea, Rep. of	102.3	293.8	295.3	610.7	326.7	594.8	656.2	355.5	673.5	849.3	907.2	1363.3	1947.7	—
China, People's Rep. of	0.0	0.1	8.3	14.1	26.9	7.7	84.2	139.0	343.0	491.7	534.4	834.4	1190.9	—
Germany	34.9	389.1	257.9	252.7	252.4	246.3	254.9	334.2	361.0	455.6	486.6	750.0	907.1	977.8
Netherlands	180.7	414.7	367.6	265.2	289.2	331.9	392.0	452.6	493.4	646.3	679.3	723.1	837.5	1100.3
Hong Kong	26.0	151.8	147.3	145.3	181.7	261.3	348.4	345.2	419.5	554.4	528.7	617.8	703.2	—
United Kingdom	31.4	141.7	135.8	126.4	199.0	167.7	191.4	196.6	212.5	348.8	370.6	516.8	653.9	—
Australia	20.6	339.1	454.3	674.3	208.4	275.2	149.2	158.6	309.9	297.1	372.3	403.0	627.9	746.1
Merchandise Trade														
Merchandise exports, fob	6888	21795	23348	17947	18689	20754	18527	14396	17206	19509	22974	26807	29430	32502
Merchandise imports, fob	-5469	-12624	-16542	-17854	-17726	-15047	-12705	-11938	-12532	-13831	-16310	-21455	-24626	-26481
Merchandise Trade Balance	1419	9170	6806	1893	963	5707	5822	2458	4672	5678	6664	5352	4804	6021
Terms of Trade	100.0	163.5			100.0	102.7	109.7	88.0	84.2	70.5	70.6	81.4	74.8	—

[a] millions of US dollars
Source: Asian Development Bank, (1993), *Keys Indicators of Developing Asian and Pacific Countries 1993*, Economics and Development Resource Center, Vol.24.

Table 3.4 Annual Growth of Manufacturing Value Added (MVA), (1975-1990[a])

Country or Area	Total MVA						Per-capita MVA					
	Growth Rate (percentage)		Index (1980 = 100)				Growth Rate (percentage)		Index (1980 = 100)			
	1975-1985	1985-1990	1987	1988	1989	1990[b]	1975-1985	1985-1990	1987	1988	1989	1990[b]
Hong Kong	7.3	7.5	144	155	159	163	4.9	5.9	129	137	139	140
Indonesia	14.5	10.6	222	249	274	304	12.2	8.5	193	212	227	249
Malaysia	8.4	13.9	157	185	207	244	5.8	10.9	131	150	163	187
Philippines	2.9	5.6	100	109	116	118	0.3	3.0	83	89	92	91
Republic of Korea	11.2	12.3	239	270	282	306	9.6	11.3	219	245	253	272
Singapore	6.9	13.3	137	162	178	195	5.6	11.9	126	147	160	173
Taiwan	10.6	6.8	191	198	205	204	8.6	5.6	173	177	181	179
Thailand	6.8	14.2	157	184	211	240	4.5	12.5	138	159	179	201

[a] at constant 1980 prices. [b] Provisional
Source: UNIDO (United Nations Industrial Development Organization), (1992), *Handbook of Industrial Statistics 1992*, Vienna, p.53-54.

Table 3.5 **Exports, Imports and Revealed Comparative Advantage (RCA) Indice by Different Trade Group of Manufactures[a] (Percentage)**

Product Group	Share in Total Manufactures				RCA Index	
	Exports		Imports			
	1980	1990	1980	1990	1980	1990
Food Products (part of SITC 0)	6.9	4.1	11.1	2.6	1.1	0.9
Simply Processed Materials (part of SITC 2)	34.7	9.2	3.0	4.4	11.7	4.9
Petroleum Products (SITC 332)	28.9	9.2	7.5	3.8	7.3	3.8
Animals, Vegetable Oils, Fats (SITC 4)	6.9	3.3	0.1	0.1	8.0	8.6
Fertilizers, Manufactured (SITC 56)	0.8	1.5	0.8	0.5	1.2	3.6
Wood, Cork Manufactures (SITC 63)	1.8	23.8	0.0	0.1	2.6	35.8
Textile Yarn, Fabric etc. (SITC 65)	1.1	9.7	2.3	4.1	0.3	2.9
Furniture (SITC 82)	0.1	2.2	0.1	0.2	0.1	2.1
Clothing (SITC 84)	2.4	12.9	0.0	0.1	0.9	4.0
Footwear (SITC 85)	0.0	4.3	0.0	0.0	0.0	5.2

[a] At current prices
Source: UNIDO (United Nations Industrial Development Organization), (1992), *Handbook of Industrial Statistics 1992*, Vienna, p.335.

Table 3.6 Approved New Foreign Investments[a] by Sectoral Distribution (US millions), (1986-1991)

Sector	1986	1987	1988	1989	1990	1991
Agriculture	125.9	116.7	7.7	169.7	169.7	14.3
Forestry	-	4.6	34.3	2.4	2.4	0.7
Fishing	3.9	12.0	64.9	19.5	19.5	11.0
Mining & Quaring	-	-	-	115.5	115.5	-
Manufacturing	536.7	852.3	3,784.9	5,47.9	5,647.9	3,970.3
Construction	64.7	42.2	2.4	76.8	76.8	26.4
Transport & Communications	70.0	213.0	2.5	803.0	803.0	166.8
Trade & Tourism	-	196.0	394.6	874.4	874.4	4,019.0
Real Estate & Other Services	25.0	20.3	190.3	1,041.8	1,041.8	569.7
Total	826.2	1,457.1	4,481.6	8751.0	8,751.0	8,778.2

[a] Excluding oil and banking sectors. Amounts represent original approved expansion minus cancellations.
Sources: Orginally in Bank Indonesia, *Report for the Financial Year*; Central Bureau of Statistics, *Indikator Ekonomi.*
Produced in The Economist Intelligence Unit, (1992), *Indonesia - Country Profile, 1992-93*, Business International Limited, p.77.

Table 3.7 Unit Root Tests

Variable	ADF[*l*]	PP[*tl*]
NOEX	-3.0230 [4] (0.1239)	-15.0438 [4] (0.1839)
Y	-2.1360 [5] (0.4823)	-5.1089 [5] (0.8135)
ΔNOEX	-4.9411* [2] (0.0000)	-78.361* [2] (0.000)
ΔY	-4.7542* [4] (0.0000)	-61.599* [4] (0.000)

Notes: (1) significant at 5% level. (Davidson and MacKinnon 1993).
(2) [*l*] and [*tl*] represent lags and truncated lags of ADF and PP tests respectively.
(3) P-values are in brackets.

Table 3.8 Johansen Maximum Likelihood Cointegration Tests

Variables: Non-Oil Exports, Income Max. Lags=4

(1) (Full Sample: 1975Q1-1993Q4)

Maximal Eigenvalue Statistics

Null	Alternative	Statistic	95% Critical Value
$r = 0$	$r = 1$	14.3287*	11.0300
$r \leq 1$	$r = 2$	1.3144	4.1600

Trace Statistics

Null	Alternative	Statistic	95% Critical Value
$r = 0$	$r \geq 1$	15.6430*	12.3600
$r \leq 1$	$r \geq 2$	1.3144	4.1600

Normalized cointegrating vector: Y = + 0.9459NOEX
LR Test of Restriction (H_0 =0): χ^2 (1) = 2.4494* (0.038)

(2) (Sub-Sample: 1975Q1-1983Q1)

Maximal Eigenvalue Statistics

Null	Alternative	Statistic	95% Critical Value
$r = 0$	$r = 1$	10.8344	11.0300
$r \leq 1$	$r = 2$	4.7641	4.1600

Trace Statistics

Null	Alternative	Statistic	95% Critical Value
$r = 0$	$r \geq 1$	15.5985*	12.3600
$r \leq 1$	$r \geq 2$	4.7641	4.1600

Normalized cointegrating vector: Y = + 1.6619NOEX
LR Test of Restriction (H_0 =0): χ^2 (1) = 3.9034* (0.048)

(3) (Sub-Sample: 1983Q2-1993Q4)

Maximal Eigenvalue Statistics

Null	Alternative	Statistic	95% Critical Value
$r = 0$	$r = 1$	13.8993*	11.0300
$r \leq 1$	$r = 2$	8.63113	4.1600

Trace Statistics

Null	Alternative	Statistic	95% Critical Value
$r = 0$	$r \geq 1$	22.5306*	12.3600
$r \leq 1$	$r \geq 2$	8.6313	4.1600

Normalized cointegrating vector: Y = + 1.2141NOEX
LR Test of Restriction (H_0 =0): χ^2 (1) = 4.7135* (0.030)

Notes: (1) *r* is the number of cointegrating vectors. (2) '*' indicates significance at 5%.
(3) The critical values are shown in Osterwald-Lenum (1990).

Table 3.9 Dependent Variable: ΔY (1977Q3 - 1992Q4) 62 observations
Dynamic Forecasts: (1993Q1 – 1993Q4)

Regressor	Coefficient	Standard Error	T – Ratio
Constant	0.02023	0.00639	3.1665*
$\Delta Y(-2)$	0.49572	0.10807	4.5869*
$I/Y(-2)$	0.00105	0.00294	3.5597*
$\Delta LAB(-2)$	0.17190	0.06511	2.6401*
$\Delta LAB(-3)$	-0.20180	0.04806	-4.1988*
ΔG	0.41086	0.04982	8.2468*
$\Delta G(-1)$	-0.07839	0.04290	-1.8269*
$\Delta G(-2)$	-0.21144	0.02626	-3.3753*
$\Delta NOEX$	0.08782	0.02935	2.9929*
$\Delta NOIM(-2)$	0.14275	0.02147	6.6486*
ΔR	0.22070	0.55864	3.9507*
$\Delta R(-3)$	0.17873	0.35066	5.0971*
R-Squared	0.76161	F (15, 42)	8.9455*
DW-Statistics	1.54650		

Dynamic Forecasts

Observation	Actual	Prediction	Error
1993Q1	0.01660	-0.00643	0.02303
1993Q2	0.37100	0.02028	0.16818
1993Q3	0.27400	0.01809	0.00931
1993Q4	0.21200	0.02848	-0.00728

Mean Prediction Errors	0.01047
Sum Squares Predicton Errors	0.00238
Mean Sum Absolute Prediction Errors	0.01411
Root Mean Sum Square Prediction Errors	0.01543

* significantat 5% level.

Table 3.10 Dependent Variable: ΔY (1977Q3 - 1992Q4) 62 observations
Dynamic Forecasts: (1993Q1 - 1993Q4)

Regressor	Coefficient	Standard Error	T - Ratio
Constant	-0.24666	0.11937	-2.0663*
ΔY(-2)	-0.48063	0.10970	-4.3812*
I/Y(-4)	0.10147	0.00374	2.7123*
ΔLAB(-2)	-0.75542	0.29822	-2.5331*
ΔLAB(-4)	0.21342	0.07831	2.7252*
ΔG	0.13258	0.05124	2.5873*
ΔG(-3)	-0.11256	0.03968	-2.8371*
ΔG(-4)	-0.26873	0.04030	-6.6678*
ΔEXRATIO(-1)	-1.01070	0.27702	-3.6485*
ΔEXRATIO(-2)	1.28370	0.24055	5.3364*
ΔEXRATIO(-4)	0.47365	0.17546	2.6994*
ΔNOIM	-0.76079	0.02418	-3.1455*
ΔR	0.18841	0.03829	4.9202*
ΔR(-2)	0.19378	0.03775	5.1334*
S1	-0.01945	0.00661	-2.9421*
TIME	-0.00125	0.00374	-3.3534*
R-Squared	0.77961	F (15, 42)	7.0750*
DW-Statistics	2.08530		

Dynamic Forecasts

Observation	Actual	Prediction	Error
1993Q1	0.01660	-0.00473	0.01187
1993Q2	0.37100	0.02599	0.11110
1993Q3	0.27400	0.02216	0.00524
1993Q4	0.21200	0.02101	0.00193

Mean Prediction Errors	0.00710
Sum Squares Predicton Errors	0.00073
Mean Sum Absolute Prediction Errors	0.07103
Root Mean Sum Square Prediction Errors	0.00854

* significant at 5% level.

Table 3.11 Alternative Tests for Non-Nested Regression Models

Dependent Variable: DY	66 observations used from 1977Q3 to 1993Q4			
Regressors for Model M1:				
Constant	ΔY(-2)	I/Y(-2)	ΔPOP(-2)	ΔPOP(-3)
ΔG	ΔG(-1)	ΔG(-2)	ΔNOEX	ΔNOIM(-2)
ΔR	ΔR(-3)			
Regressors for Model M2:				
Constant	ΔY(-2)	I/Y(-4)	ΔPOP(-2)	ΔPOP(-4)
ΔG	ΔG(-3)	ΔG(-4)	ΔEXRATIO(-1)	ΔEXRATIO(-2)
ΔEXRATIO(-4)	ΔNOIM	ΔR	ΔR(-2)	S1
TIME				

Test Statistic	M1 against M2	M2 against M1
N-Test	-11.0485*	-3.5754*
NT-Test	-2.2888*	-0.6654
W-Test	-2.0670*	-0.6513
J-Test	4 .7547*	2.3535
J A-Test	1.5418	0.9713
Encompassing	F(11, 43) = 1.8691	F(7, 43) = 0.9924

Model M1: DW 1.7667; R-Bar-Squared 0.33160; Log-likelihood 210.9603
Model M2: DW 1.6616; R-Bar-Squared 0.43274; Log-likelihood 218.9144
Model M1+M2: DW 1.6525; R-Bar-Squared 0.43214; Log-likelihood 223.8565
Akaike's Information Criterion of M1 versus M2 = -3.9541 favours M2

* significant at 5% level.
N -Test is the Cox test derived in Pesaran.
NT-Test is the adjusted Cox test derived in Godfrey and Pesaran.
W -Test is the Wald-type test proposed in Godfrey and Pesaran.
J -Test is the Davidson and MacKinnon test.
JA-Test is the Fisher and McAleer test.

Table 3.12 Johansen Maximum Likelihood Cointegration Tests (Annual Data)

Variables: Non-Oil Exports, Income   Max. Lags=2

Full Sample: 1978-1993

Trace Statistics

Null	Alternative	Statistic	95% Critical Value
$r = 0$	$r \geq 1$	29.504*	23.830
$r \leq 1$	$r \geq 2$	4.1376	11.540

Normalized cointegrating vector: Y = + 0.6175NOEX
LR Test of Restriction (H_0 =0): χ^2 (1) = 12.793* (0.000)

Notes: (1) *r* is the number of cointegrating vectors. (2) '*' indicates significance at 5%.
(3) The trace statistics is corrected for small sample bias (see Reimers, 1992). The critical values are shown in Osterwald-Lenum (1990).

Table 3.13 Dependent Variable: ΔY (1978 - 1993) (Annual Data)

Regressor	Coefficient	Standard Error	T – Ratio
Constant	-0.1964	0.0309	-6.2629*
ΔY(-1)	-1.9754	0.2442	-8.0897*
ΔNOEX	0.4229	0.4655	9.0837*
ΔNOEX(-1)	0.2880	0.0656	4.3917*
ΔNOIM	0.2111	0.0380	5.5522*
ΔNOIM(-1)	0.5632	0.0727	7.7403*
ΔG	0.4628	0.0415	11.148*
ΔG(-1)	1.1846	0.1593	7.4382*
ΔR(-1)	-0.5888	0.2357	-2.4986**
ΔLAB	-1.0369	0.1383	-7.4985*
I/Y	-0.1171	0.0180	-6.5018*
R-Squared	= 0.9998	F-statistics F(11,3)	= 1690.7*
ARCH	Chi-Sq(1) = 2.6107		
Functional Form	Chi-Sq(1) = 9.3745*		
Normality	Chi-Sq(1) = 0.8829		
Heteroscedasticity	Chi-Sq(1) = 2.4015		

'**' and '*' represent level of significance at 10% and 5% respectively.

Table 3.14 **Dependent Variable: ΔY (1978 - 1993) (Annual Data)**

Regressor	Coefficient	Standard Error	T - Ratio
Constant	-0.1154	0.0387	-2.9776*
ΔEXRATIO(-1)	0.2532	0.0703	3.6016*
ΔNOIM	0.1716	0.0795	2.1593**
ΔNOIM(-1)	0.2887	0.0635	4.5478*
ΔG	0.7026	0.0544	12.921*
ΔG(-1)	-0.3524	0.07806	-4.5146*
ΔR	-0.6405	0.2994	-2.1395**
I/Y	-0.0586	0.0213	-2.7462*
R-Squared	= 0.9977	F-statistics F(8, 6)	= 330.954*
ARCH	Chi-Sq(1) = 2.6878		
Functional Form	Chi-Sq(1) = 1.6517		
Normality	Chi-Sq(1) = 0.4178		
Heteroscedasticity	Chi-Sq(1) = 0.4228		

'**' and '*' represent level of significance at 10% and 5% respectively

Table 3.15 Alternative Tests for Non-Nested Regression Models (Annual Data)

Dependent Variable: DY 1978 to 1993				
Regressors for Model M1:				
Constant	ΔY(-1)	ΔNOEX	ΔNOEX(-1)	ΔNOIM
ΔNOIM(-1)	ΔG	ΔG(-1)	ΔR(-1)	ΔLAB
I/Y				
Regressors for Model M2:				
Constant	ΔEXRATIO(-1)	ΔNOIM	ΔNOIM(-1)	ΔG
ΔG(-1)	ΔR	I/Y		

Test Statistic	M1 against M2	M2 against M1
N-Test	-3.4982*	-9.8961*
NT-Test	-1.4339	-1.8674**
W-Test	-1.3091	-1.2250
J-Test	1.8949**	5.1475*
J A-Test	1.2341	0.1666
Encompassing	F(2, 3) = 6.9318	F(5, 3) = 10.8556*

Model M1: DW 2.9097 ; R-Bar-Squared 0.99313 ; Log-likelihood 49.5398
Model M2: DW 2.7666 ; R-Bar-Squared 0.98542 ; Log-likelihood 39.7577
Model M1+M2: DW 2.1286 ; R-Bar-Squared 0.99796 ; Log-likelihood 63.3521
Akaike's Information Criterion of M1 versus M2 = 6.7821 favours M1
Schwarz's Bayesian Criterion of M1 versus M2 = 5.6232 favours M1

'**' and '*' represent level of significance at 10% and 5% respectively.
N -Test is the Cox test derived in Pesaran.
NT-Test is the adjusted Cox test derived in Godfrey and Pesaran.
W -Test is the Wald-type test proposed in Godfrey and Pesaran.
J -Test is the Davidson and MacKinnon test.
JA-Test is the Fisher and McAleer test.

Table A3.1 Average Annual Growth Rates of GDP and Merchandise Exports (Percent)

Area	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
East Asia &	3.5	6.5	2.5	8.6	10.7	7.3	5.7	5.7	5.8	8.1	10.3	7.5	7.4	8.8
Pacific	**-8.4**	**5.2**	**17.5**	**11.6**	**13.2**	**5.9**	**9.9**	**5.7**	**5.0**	**11.0**	**14.8**	**4.5**	**12.4**	**14.3**
South Asia	1.3	8.8	2.3	7.2	6.8	-3.0	6.6	6.8	4.1	7.2	3.7	5.9	4.6	3.1
	-3.0	**6.4**	**22.3**	**1.5**	**1.8**	**8.0**	**-5.3**	**-0.1**	**6.6**	**6.6**	**0.4**	**3.8**	**8.9**	**10.2**
Sub-Saharan	8.0	-2.6	6.6	3.9	-1.9	4.5	3.4	-1.1	1.2	-2.2	-2.8	5.1	3.1	-1.3
Africa	**-18.6**	**-2.2**	**9.2**	**1.0**	**-9.0**	**17.7**	**-2.2**	**-21.4**	**-11.0**	**-5.3**	**10.5**	**12.6**	**0.3**	**-3.0**
Middle East &	6.8	6.2	7.2	9.1	6.3	7.0	4.8	4.3	6.3	5.4	4.4	5.9	2.3	0.8
North Africa	**-26.7**	**4.0**	**6.6**	**5.9**	**9.2**	**14.2**	**-9.1**	**-1.8**	**3.2**	**5.4**	**5.0**	**5.7**	**5.5**	**1.1**
Latin America	6.1	3.3	6.0	4.7	4.9	6.5	6.0	1.4	-1.2	-2.8	3.6	3.7	3.6	2.6
& Caribbean	**-21.6**	**4.0**	**2.5**	**2.7**	**8.1**	**7.2**	**5.2**	**5.5**	**-1.3**	**4.6**	**11.2**	**1.7**	**-4.5**	**6.1**
Industrialized	0.6	-0.3	4.5	3.6	4.1	3.2	1.3	1.6	-0.2	2.6	4.7	3.4	2.7	3.3
Countries*	**10.8**	**-1.5**	**9.1**	**7.1**	**4.3**	**3.4**	**6.2**	**3.3**	**-1.8**	**1.8**	**9.7**	**4.2**	**1.5**	**—**

Note: Bolded numbers represent the growth of merchandise exports; * including Japan, United States and European Community

Source: The World Bank, *World Tables, 1988-89 Edition*, The Johns Hopkins University Press.

Table A3.2 Orientation of Trade Strategy, (1965-73 & 1973-84)

1965-73	1973-84
Outward Oriented	Outward Oriented
Strongly outward oriented Korea, Singapore, Hong Kong	*Strongly outward oriented* Korea, Singapore, Hong Kong
Moderately outward oriented Thailand, Colombia, Malaysia, Ivory Coast, Cameroon, Indonesia, Brazil, Costa Rica, Guatemala, Israel	*Moderately outward oriented* Malaysia, Brazil, Chile, Israel, Thailand, Tunisia, Turkey, Uruguay
Inward Oriented	Inward Oriented
Moderately inward oriented Mexico, Philippines, Bolivia, Yugoslavia, Senegal, El Salvador, Honduras, Madagascar, Nicaragua, Nigeria, Tunisia, Kenya	*Moderately inward oriented* Philippines, Indonesia, Ivory Coast, Colomia, Nicaragua, Honduras, Pakistan, Yugoslavia, Sri Lanka, Mexico, Senegal, Kenya, Cameroon, Costa Rica, El Salvador, Guatemala
Strongly inward oriented Dominican Republic, Ghana, India, Sri Lanka, Tanzania, Pakistan, Sudan, Uruguay, Ethiopia, Peru, Chile, Turkey, Bangladesh, Burundia, Zambia, Argentina	*Strongly inward oriented* Nigeria, Ghana, Madagascar, Bangladesh, Burundi, Zambia, Bolivia, Peru, Dominican Republic, India, Tanzania, Sudan, Ethiopia, Argentina

Source: Greenaway and Nam (1988) p.425

Chapter 4 A Study of Export Growth: Causality and Cointegration Tests

4.1 Introduction

There is widespread opinion about the link between real exports and output growth. The economic success of the newly industrialized countries (NIEs) in the East Asia, namely, South Korea, Taiwan, Hong Kong and Singapore, is believed to be the result of export-led industrialization. Indonesia, noted as a newly industrialized country, has implemented a series of trade reforms and policies toward industrializationand foreign direct investment. An interesting issue to examine is whether the export-led hypothesishas been a criticalelement to the growth of the Indonesianeconomy.

Export-led strategy has become one of the core areas to be studied in development economics. The fast economic growth in the Asia-Pacific countries' witnesses a positive linkage of export and output growth. The support for export promotion over import substitution strategy therefore, provides a sharp and effective growth strategy for the developing countries. Previous empirical studies on the relationship between exports and output growth may have some drawbacks. First, it is likely to regress real output growth on contemporaneous export growth (Fajana, 1979; Kavoussi, 1984; Gonçalves and Richtering, 1987) or relate the variables by rank correlation (Singer and Gray, 1988). The statistical significance or the presence of significant correlation does not tell any causal link or direction between export and output growth. As export and economic growth might have "cause and effect" to one another, the hypothesis of export-led growth would become ambiguous since the direction of causation is unknown. Second, much literature for testing export and growth relationship usually depends on time series data (Jung and Marshall, 1985; Ram, 1987; Kunst and Marin, 1989). However, most of the macroeconomic series are non-stationary and regressing those variables may easily lead to spurious regression results (Granger and Newbold, 1974). Causality test is only valid when the pair of the variables is stationary. Moreover, the cointegrating properties imply that original causality tests are invalid when the series are cointegrated

(Granger, 1988). On the other hand, if two series are cointegrated, there is a common trend of which causality will exist in at least one direction (Miller and Russek, 1990). This dynamic relationship can be represented by the error correction model, which captures the knowledge of cointegrated properties of the time series.

The paper tries to uncover the causation relation of: i) real non-oil export sector and real economic growth; and ii) real oil export sector and real economic growth. The main concern is whether higher non-oil export growth triggers higher output growth, or the output growth still depends on the expansion of the oil sector. Hence, the validity of export-led strategy will be supported by the statistical significance of causation analysis. The results may provide solutions on Indonesia's export sector.

The paper is divided as follows: Recent literature survey on export-led growth is presented in Section 2. Data sources and methodologies are discussed in Sections 3 and 4 respectively. The latter section accommodates three causality tests, namely, Granger test, Sims's test and Geweke, Meese and Dent test. Causality and cointegration techniques are applied where appropriate. Section 5 reports the empirical results. Whereas quarterly data may be unavailable to some series, such as GDP, the method of interpolation is applied. However, the use of interpolation may understate the true degree of uncertainty about the parameter values. Section 6 therefore addresses the issue of interpolation and models are re-run by using the annual data. Conclusion and policy implications are in the last section.

4.2 Literature Survey

The relationship between real export and real output growth is extensively documented in recent literature. Positive statistical association of the two variables is evident in explaining the economic experience of the 'Four Little Dragons'. Papers like Little and *et.el.* (1970); Bhagwati (1978); and Balassa (1982), all suggest that it is important to exploit developing countries' comparative advantage through outward trade. Export promotion leads to the achievement of economies of scales and allocation efficiencies. Export of manufactured goods also improves income distribution in a labour-abundant country like Indonesia.

Jung and Marshall (1985) give an account for the export-led hypothesis. Their arguments (1985, p.3) are: 1) export growth may increase demand for the country's output and therefore increase output; 2) export growth may relax foreign exchange constraint and thus cause output growth by increasing demand for immediate imports; 3) export growth may increase efficiency through economies of scale and exchange control liberalization.

Table 4.1 provides a summary of empirical studies for export-output growth. The table shows recent empirical results starting from the mid-eighties. Surprisingly less than a half of the total articles are found to be supportive to EP. This is in great contrast to the conclusions of previous surveys like Greenaway and Reed (1990). The differences, however, may be due to: 1) Economic consequences of trade liberalization in the eighties on output growth were neglected in most of the papers[1] which were reviewed; 2) there has been a strong association between export and output growth since the latter is an endogenous variable to export. Preceding econometric techniques such as rank correlation and OLS test did not provide any causal relationship between the two variables.

Ram (1985) investigates 73 LDCs for the importance of exports on output growth. Using White's (1980) specification test for homoscedasticity, the paper confirms the statistical significance of export to economic growth. The relevance seems to be apparent in the seventies. In another article, Ram (1987) uses time series and cross section methods for estimating export-output growth in 88 countries. He concludes that the role of export in economic growth is "predominately positive".

Jung and Marshall (1985) apply Granger causality test and find that only 4 out of 37 countries are in favour of EP. They argue that "the lack of support for the export promotion hypothesis casts some doubt on the efficacy of policies designed to enhance development by pushing the export sector. At the very least, it suggests that the statistical evidence in favour of export promotion is not as unanimous as was previously thought". Darrat (1987) investigates the economies of Hong Kong, Korea, Singapore and Taiwan. By applying White's (1980) test, only Korea is in favour of EP strategy. He concludes that economic success of the Four Little Dragons is not stuck to export-oriented strategy. On the contrary, economic growth leads export growth in the case of Singapore and Taiwan; and no causality is found in Hong Kong.

Gonçalves and Richtering (1987) use 3 indicators for testing export performance: annual growth rate of total exports volume; average ratio of exports to GDP, and the change in export/GDP ratio. Applying econometric techniques of rank correlation, OLS and cluster analysis, the evidence for EP is mixed. Contrast to Darrat (1987), Chow (1987) finds that there is a bi-directional causality for Hong Kong, Singapore, Taiwan and Korea. Singer and Gray (1988) use Spearman rank correlation to find the association of outward orientation[2] and output growth. They argue that high growth rate of export earnings is only due to strong external demand; and outward orientation cannot be considered as a universal recommendation for all conditions and for all types of countries (p.403).

Other studies, such as Kunst and Marin (1989) used data from developed countries. Their model includes labour, capital and dummies as the exogenous variables and applied them to the Austrian economy. Using Granger causality tests in the unrestricted vector autoregression (UVAR) and the subset model autoregression (SMAR) specifications, they cannot find any causal effect from export to output growth. On the other hand, a positive causality is running from productivity to export that is consistent to the theories of intra-industry trade. Subject to this adverse causality effect, they conclude that "disturbances caused by a devaluation of exchange rate and/or by an import tariff do not seem to be capable of boosting productivity in Austria as implied by the export-led growth and recent trade models (p.703)".

Moschos (1989) employs a production function framework that the rate of technical change is a linear function of export growth. Applying Quandt's switching regression method (1958) and using cross section data for the period of 1970-1980 for 71 countries, he argues that the positive effect of export expansion to output growth is not only limited to more advanced developing countries. Export expansion as well as capital formation, however, mainly influences the less developing countries' output growth. Bahmani-Oskooee & *et.al.* (1991) use Granger causality test and find some support for EP. Sheehey (1992) uses three alternate export variables for estimation. The purpose is to avoid a built-in correlation between export and output. Nevertheless, he concludes that the results are quite inconclusive by using different alternatives. Ghartey (1993) applies Hsiao's causality test in detecting the direction of causation. Using Taiwan, Japan and US as the examples, however, the results are rather mixed.

A new econometric technique has been recently applied in the time series data. The use of cointegration and Granger causality test that incorporates the Error Correction Terms introduced in the literature. Based on cointegration and Granger test, Marin (1992) confirms that the outward oriented policy is applicable to the developed and less developed countries. The hypothesis of export-led growth, he argues, cannot be rejected for countries like United States, Japan, United Kingdom and Germany. Serletis (1992a) uses Canadian data for exports, import, and GNP. He finds that these variables are cointegrated. The models show that "the growth of GNP and export growth are independent and expansion in exports promotes the growth of national income." Oxley (1993) and Bahamani-Oskooee and Alse (1993) add an error-correction term in their models. Oxley finds no support for EP in Portugal; whereas Bahamani-Oskooee and Alse find strong empirical support for the feedback relationship between export and output in all the samples. A positive long-run relationship between the two variables is also confirmed.

4.3 Data Sources

The variables are oil sector exports (OEX), non-oil sector exports (NOEX), and gross domestic product (Y). The data are adjusted by the CPI deflator. OEX, and NOEX are extracted from the Balance of Payments Statistics (BOP), whereas Y is from the International Financial Statistics (IFS), International Monetary Fund, various issues.[3] The sample covers from 1974Q1 to 1993Q4, quarterly data. All the variables are in logarithmic form. Since there is insufficient sample size, we use interpolation technique to convert the annual data into quarterly data. We adopt Goldstein and Khan's (1976) interpolation method by fitting a quadratic curve to three successive annual observations. Shiller and Perron (1985) show that it is the length of a data set, which is important to investigate the low frequency components.

4.4 Methodology

4.4.1 Causality Issues

Export growth may show a positive correlation to economic growth. However, one cannot say about the direction of association, say x_t causes y_t or y_t causes x_t. Therefore, one cannot decide the causality effects of exports and economic growth, or these regressions do not provide any means of determining the direction of causality. The causality concept for investigating a country's export to its economic growth has become the core of research in recent studies. In this section, we would introduce the meaning of causality and three types of tests, namely, Granger causality test (1980), Sims's Causality test (1972) and Geweke, Meese and Dent test (1983).

4.4.1.1 Granger Causality and Test

What is causality inference? Borrowing the idea from Granger causality concept:
"x is a Granger cause y ($x \rightarrow y$), if y can be better accurately forecasted by using past value of x rather than not doing so, other information being identical". This statement can be formulated as (Granger 1980):

Y_t is a cause of X_{t+1} iff

$$F(X_{t+1}/\Omega_t) \neq F(X_{t+1}/\Omega_t - Y_t)$$

Both Y_t and X_{t+1} are two stochastic variables. F is a conditional distribution of X. Ω_t is a complete information set available at time t. "For causation to occur, the variable Y_t needs to have some unique information about what value X_{t+1} will take in the immediate future" (Granger 1980).

However, in order to make the definition operative, "Granger has to substitute for the complete information set W the incomplete information set J_t, an information set actually available at time t, and J'_t for the information set J_t plus the past and present values of Y_t", (Vercelli 1992). In Granger's (1988) paper, he lets $f(x \mid J)$ be the conditional distribution of x given J and $E(x \mid J)$ be the corresponding conditional mean, and the following definition of causality and non-causality are given as:

(i) y_t does not cause $x_{t=1}$ with respect to J_t if

$$f(x_{t=1} \mid J_t) = f(x_{t=1} \mid J'_t)$$

(ii) if

$$f(x_{t=1} \mid J_t) \neq f(x_{t=1} \mid J'_t),$$

then y_t is a 'prima facie' cause $x_{t=1}$ with respect to J_t.

(iii) if

$$E(x_{t=1} \mid J_t) = E(x_{t=1} \mid J'_t),$$

then y_t does not cause $x_{t=1}$ in mean, with respect to J_t.

(iv) if

$E(x_{t=1} \mid J_t) \neq E(x_{t=1} \mid J'_t)$,

then y_t is a 'prima facie' cause in mean of $x_{t=1}$ with respect to J_t.

The term 'in mean' as Granger (1988) says that, if y_t causes x_t, then x_{t+1} is better forecast if the information in y_{t-j} is used than if it is not used, where 'better' means a smaller variance of forecast error, or the matrix equivalence of variance. And hence, an vector autoregressive model (VAR) is then presented and tested as:

$$y_t = C_t + \sum_{i=1}^{n} \alpha_i y_{t-i} + \sum_{i=1}^{n} \beta_i x_{t-i} + \sigma_t \tag{4.1}$$

where C_t is the deterministic part of the equation. The null hypothesis is testing the zero restriction of all β's. i.e.

$H_0 : \beta_1 = \beta_2 = \cdots\cdots = \beta_n$

$H_1 : \beta_1 \neq \beta_2 \neq \cdots\cdots \neq \beta_n$

If the null hypothesis is rejected by either using F-test or Lagrange Multiplier (LM) test, and x is said to Granger-cause y ($x \rightarrow y$).

4.4.1.2 Sims's Causality and Test

Sims (1972) interprets the causality concept, as the future cannot cause the present. Sims shows that in a regression of X on past, present and future values of Y, the null hypothesis of non-causality from X to Y means that all the coefficient of the future values of Y are equal to zero. Therefore, Sims test used distributed lag regression and the equation is shown as:

$$X_t = \sum_{i=-\infty}^{\infty} \delta_i Y_{t-i} + v_t \tag{4.2}$$

where $\delta_i = 0$ for all $i < 0$ iff X does not Granger-cause Y. Moreover, in his paper, Sims also takes care of the serial correlation problem by using the distributed lag methodology. He remarks that ".... to make fairly precise use of F-tests on groups of coefficients, it is important that the assumption of serially uncorrelated residuals be approximately accurate. Therefore all variables used in regressions were measured as natural logs and *prefiltered.....*" (1972, p.545). Using the prefiltering provided, each logged variable is filtered as:

$1 - 1.5L + 0.5625L^2$ or each $x(t)$ is replaced by

$x(t) - 1.5x(t-1) + 0.5625x(t-2)$, and

then compute a two-sided distributed lag of X on past, present and future Y, and tests the leads of Y, for testing X Granger-cause Y. Nevertheless, both Granger test and Sims test are not the same in practice. Doan (1992) argues that "while the two testing procedures are equivalent theoretically, they are different in practice, because they must be estimated using finite parameterizations of the autoregression (for Granger) and distributed lag (for Sims), which do not directly correspond" (6-10).

4.4.1.3 Geweke, Meese and Dent (GMD) Test

Geweke, Meese and Dent (1983) examine several causality models and find that Sims test is sensitive to failure to correct serial correlation of an equation. They argue that "the sampling distribution of statistics for Sims tests requiring correction for serial correlation conformed very poorly to its limiting distribution and was sensitive to prefiltering under the null hypothesis: under the alternative, rejection frequencies also departed from their limiting values............The variants of the Sims test which require correction for serial correlation require much more computation time and more decisions about parameterizations" (p.185). Thus, they use a two-sided distributed lag augmented with lagged dependent variables:

$$x_t = C_t + \sum_{i=1}^{n} \eta_i x_{t-i} + \sum_{i=\_k}^{n} \tau_i y_{t-i} + \omega_t \tag{4.3}$$

Leading values of y are added in Eq. 4.3. For x is Granger-cause y, we test whether the coefficients on leading values y_t, i.e. τ_{-1}, τ_{-2}, τ_{-3},....., τ_{-k} are jointly equal to zero. A non-zero restriction on all τ's means that the null hypothesis is rejected and x is then Granger-cause y. Charemza and Deadman (1992) comment that since the tests are based on different philosophical background (p.194), it is difficult to determine which test is the best of all. We hereby report all the three tests.

4.4.2 Causality and Cointegration

There are problems dealing with time series studies. First, most of the macroeconomic series are non-stationary. In other words, they are integrated of order 1, such that $x_t \sim I(1)$. Non-stationary series lead to spurious regression results. Granger and Newbold (1974) state that spurious regression is found when an I(1) process is regressed against another I(1) process. One of the methods to eliminate non-stationary series is to apply first-differencing in the regression. However, Miller (1991) argues that first-differencing filters out low-frequency (long run) information. Besides, causality tests are only valid when the variables are stationary. In order to solve the problems, unit root tests, cointegration and error-correction term are introduced in the statistical analysis.

Causality tests are valid when the change of the original variable is not cointegrated. If the series are cointegrated, causal inferences will be invalid. Granger asserts that "many of the papers discussing causality tests based on the traditional time-series modelling techniques could have missed some of the forecastability and hence reached incorrect conclusions about non-causality in mean. On some occasions, causation could be present but would not be detected by the testing procedures used. This problem only arisen when the series are I(1) and co-integrated, but this could be a common situation when causality questions are asked. It does seem that many of the causality tests that have been conducted should be re-considered" (1988, p.204). Hence, it is necessary to check whether the series are cointegrated because the presence of cointegration invalidates original causality tests.

The validity and the interpretation of the tests are highly depended on appropriate specification. If autocorrelation is present, empirical result is invalid because LM statistic does not have the required distribution. One way to handle the issue is to make the lag length long enough to eradicate possible autocorrelation. However, as Thornton and Batten (1985) show that the results of the Granger-causality tests are very sensitive to the lag orders of the right hand side of the equation. Applying arbitrary lags may lead to erroneous interpretation. Some criteria have been made for determining the length of a distributed lag. We therefore choose Akaike Information Criterion (AIC) (Akaike 1973) to determine the specification of lags because it provides most convenient way for computation.[4] The optimum lag length is determined by minimising the AIC function.

4.4.2.1 Cointegration and Integration

The definition of cointegration can be found in the literature of Granger (1983) and Engle and Granger (1987). A non-stationary time series X_t is said to be integrated of order d or $I(d)$ if it requires to be differenced d times to yield a stationary, invertible and non-deterministic ARMA representation. If any two series, X_t and Y_t are non-stationary and integrated to the same order d, the series are said to be cointegrated and there will exist a linear combination such that $Z_t = Y_t - bX_t$, and $Z_t \sim I(d-b)$ where $d > 0$. If $d=b=1$ and $Z_t \sim I(0)$, i.e. $X_t = Y_t \sim I(1)$, then the residual of their linear combination Z_t is $I(0)$.[5] Acceptance of the null hypothesis implies the non-existence of long-run relationship between X_t and Y_t.

Before finding the cointegration vectors, one should investigate the degree of integration. If a series x_t is integrated of order one, i.e. $x_t \sim (1)$, it implies that the root of the autoregressive representation of the series lies inside the unit circle. Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests care used to test for the presence of unit roots. Asymptotic P-values are computed using the coefficients in the MacKinnon (1990) reference. If the two time series are integrated with the same order, the residual of the linear combination of the two series is to be stationary. Hence, an error-correction mechanism[6] can be presented under the concept of Granger Representation Theorem.

4.4.2.2 Error Correction Model

Causality issue can be applied with the aid of cointegration and error correction model. As discussed, conventional causality tests will be employed if two time series are not cointegrated. That is to say, we are able to apply Granger test, Sims test and Geweke, Meese and Dent test to obtain the causality result by testing the joint coefficients in each model. On the other hand, if the null hypothesis of no cointegration is rejected, it implies that two time series, X_t and Y_t will have long run co-movement and do not drift apart. Miller and Russek (1990) states that whenever X_t and Y_t have a common trend (the presence of cointegration), causality will exist in at least one direction. This dynamic relationship is based on the error-correction model, which contains the knowledge of cointegrated properties of the time series variables. According to Granger's paper (1986), an error-correction model in a bivariate case is shown as:

$$\Delta x_t = f_1 z_{t-1} + \text{lagged } \Delta x_t, \Delta y_t + e_{1t},$$

$$\Delta y_t = f_2 z_{t-1} + \text{lagged } \Delta x_t, \Delta y_t + e_{2t}, \qquad (4.4)$$

where $z_t = x_t - Ay_t$.[7]

In Eq. 4.4, either Δx_t or Δy_t is caused z_{t-1} which is itself a function of x_{t-1} and y_{t-1}. Therefore, x_{t+1} is caused by y_t or y_{t+1} by x_t if the two series are cointegrated. (see Granger 1988, p.203). Cointegration is related to long run equilibrium and causality in mean is concerned with short run forecastability. He claims that "for a pair of series to have an attainable equilibrium, there must be some causation between them to provide the necessary dynamics" (p.203). In our model, if the series of exports and economic growth cointegrated, an error-correction term will be added in the equation:

$$(1-L)X_t = \beta_1 + \delta_1 z_{t-1} + \sum_{i=1}^{r} \iota_{1i}(1-L)X_{t-i} + \sum_{i=1}^{s} \lambda_{1i}(1-L)Y_{t-i} + \nu_{1t} \qquad (4.5)$$

$$(1-L)Y_t = \beta_2 + \delta_2 z_{t-1} + \sum_{i=1}^{r} \iota_{2i}(1-L)Y_{t-i} + \sum_{i=1}^{s} \lambda_{2i}(1-L)X_{t-i} + \nu_{2t} \qquad (4.6)$$

where L is the lag operator and v_{1t}, v_{2t} are stationary residuals of Eqs. 4.5 and 4.6 respectively. z_{t-1} is the error-correction term, which must be stationary if X and Y series are cointegrated. The inclusion of the error-correction term gives an alternative conclusion to the conventional causality test. Based on Eq. 4.6, if X_t is said to Granger cause Y_t, not only does the coefficient, λ_{2i}, is jointly significant, but also the coefficient of the error-correction term, δ's is statistically significant. As Granger (1988) and Miller and

Russek (1990) assert that if two time series are cointegrated, a causal link is present in an equation such that there is statistically significance of δ's even though λ's shows no jointly statistical significance.

4.5 Empirical Results

Most macroeconomic time series are non-stationary. The order of integration is tested to identify the stationarity properties of the series. Two unit root tests are employed, namely, Augmented Dickey-Fuller and Phillips and Perron tests. The optimal lag is chosen by the Akaike Information Criterion (AIC). Table 4.2 reports the results of unit root tests. The series are in log-level. The relevant critical values are found in Davidson and MacKinnon (1993). The brackets shown are the P-values. The Table shows that the null hypothesis of a unit root cannot be rejected for any of the variables. In contrast, when the tests are applied to first-differencing of the variables, the null hypotheses are firmly rejected at 5% significant level.

Having found that the series are I(1), we investigate whether the pairs of (NOEX, Y) and (OEX, Y) are cointegrated. If two series are I(1) and cointegrated, there will have a linear combination such that $z_t = Y_t - \beta X_t$ and $z_t \sim I(0)$. Table 4.3 reports the Johansen Maximum Likelihood cointegration tests, of which the maximal eigenvalue statistics and trace statistics are used. For the pair of non-oil exports and income (NOEX, Y), the null hypothesis of zero cointegrating vectors is rejected by both the maximal eigenvalue and trace statistics. On the other hands the hypothesis of at least one cointegrating vector is not rejected. By applying the same sample size to oil exports and income, the null hypothesis of no cointegration cannot be rejected at 5% significant level by using either the maximal eigenvalue statistics or trace statistics.

Since the series of non-oil export growth (ΔNOEX) and economic growth (ΔY) are cointegrated, Granger (1988) claims that there will have some causation between the series to provide the necessary dynamics. Causality is used with the aid of cointegration and error correction model. Miller and Russek (1990) states that "so long as *x* and *y* have a common trend,......, causality must exist in at least one direction". The error-correction terms, $\lambda_i Z_{t-1}$, therefore, are included in Eq. 4.5 and Eq. 4.6. The importance of adding an error-correction term is to differentiate from the conventional Granger causality test, which does not test the nature of stationarity of the series. Based on Eq. 4.6, if X_t and Y_t are cointegrated and X_t is said to Granger cause Y_t, there is a causal link in the equation that the coefficient of δ's must be statistically significant, even though λ's shows no jointly statistical significance.

Table 4.4 reports the result of the error-correction models. The two equations are derived from Eq. 4.5 and Eq. 4.6. The error correction term, z_{t-1}, is the residual of cointegration equation lagged by one period of time. In the first equation, ΔNOEX is regressed against ΔY whilst ΔY is regressed against ΔNOEX in the second equation. Both ECM equations are statistically significant, whereas the first ECM is at 10% and the second at 5% level. It means that there is a bi-directional causation between real non-oil exports growth and economic growth. The absolute value of ECM in the first equation is smaller than the second one and both show negative signs. In the first equation, for example, the value of z_{t-1}, indicates a 12% of disequilibrium is eliminated by the change in non-oil export growth within a quarter. For the joint coefficients, the LM-statistic for Σ(1-L)ΔY in the first equation shows statistical significance at 5% level whereas the LM-statistic for Σ(1-L)ΔNOEX in the second does not. Therefore, the inclusion of error-correction term allows the issue of temporal causality between the non-oil exports and economic growth (Miller 1991; Miller and Russek 1990). Except the serial correlation problem is found in the first equation, the two equations are well performed in the post regression analysis. The overall results imply that the bi-directional causality tests do not support the export-led growth theory, which emphasises the growth of export unidirectionally contributes to higher economic growth.

Conventional causality tests are valid when the original variables are not cointegrated. Since oil exports (OEX) and income (Y) are not cointegrated, we apply the causality tests to these series. Three causality test procedures are used, namely, Sims' causality test, Geweke, Meese and Dent causality test and Granger causality test. The optimal lag order is determined by Akaike Information Criteria (AIC) whereas ΔOEX → ΔY is 2 and ΔY → ΔOEX is 3 ("→" represents "Granger causes"). Table 4.5 shows the causality results of which real oil export growth causes real output growth. The null hypothesis is that there is no causation between real oil exports and income growth. Only the Sims' test and Granger test show that the null hypotheses are rejected at 10% significant level. In two out of three causality tests, there is evidence showing that the oil export growth contributes economic growth in Indonesia.

On the other hand, Table 4.6 reports the causality tests of which real output growth causes real oil export growth ($\Delta Y \rightarrow \Delta OEX$). In all the three tests, the F-statistics of the joint coefficients are not statistically significant either at 5% or 10%. It is only the real oil export growth unidirectionally Granger-cause the real output growth. The export-led growth hypothesis is valid in the petroleum industry in Indonesia. The results confirm with the arguments of Ram (1985), Chow (1987) and Bahamani-Oskooee and Alse (1993) that export promotion strategy is essential to economic growth.

4.6 The Issue of Interpolation

In the previous section, statistical results are reported by using quarterly data. Whereas quarterly data may be unavailable to some series, such as GDP, the method of interpolation is applied. Interpolation is used to compute the approximate value of a function, given its values at a set of points. However, the major problem of interpolation of quarterly data is that the statistical errors will understate the true degree of uncertainty about the parameter values. To reflect the true degree of the statistical results that reported earlier, we re-run the models with annual data starting from 1976 to 1993.

We report the cointegration analysis of non-oil exports (NOEX), oil exports (OEX) and GDP (Y) in Table 4.7[8]. Optimal lag is chosen by AIC and that is equal to 2. We use the Johansen trace statistic which has been corrected for small sample bias (Reimers, 1992). Therefore, we use (*T-nk*) instead of *T* in the log-likelihood ratio statistic for trace test. The trace statistic is to be more robust to non-normality of errors compared to the maximal eigenvalue statistic (Cheung and Lai, 1993). For the pair of {NOEX, Y}, the null hypothesis of no cointegration is rejected at 5% significant level, and this is at least one cointegrating vector found. The normalized equation is Y = + 0.6195 NOEX. The LR test of restriction for NOEX is 18.075 with $\chi^2(1)$, which implies the presence of the variable is not rejected. A weak exogeneity test for α is performed and the null hypothesis is also rejected at 5% significance level. Since NOEX and Y are cointegrated, Table 4.8 reports the results of error-correction model (ECM). The ECMs (z_{t-1}) in two equations show 5% statistical significance. For the joint coefficients, the LM-statistic for $\Sigma(1\text{-}L)\Delta Y$ in the first equation shows no statistical significance whilst the LM-statistic for $\Sigma(1\text{-}L)\Delta X$ in the second equation does confirm significance at 5%. On the whole, the results show that there is a bidirectional causality between non-oil exports growth and the growth of income. The export-led growth hypothesis, which emphasises the growth of export unidirectionally contributes to higher economic growth is therefore rejected. The results are in line with the previous section in which quarterly data are used.

For the pair of {OEX, Y}, Table 4.7 shows that the null hypothesis of no cointegration cannot be rejected. Therefore, we use three causality tests to confirm the movement of the variables. The optimal lag order is determined by AIC and in both of the cases, the lag values are equal to 2. Table 4.9 shows that in all three causality tests, none of them can reject the null hypothesis at 5% significance level. There is no causal relationship from real oil export growth to real output growth. It contrasts to the previous results (Table 4.5) where quarterly data are used.

Table 4.10 reports the causality test of real output growth to real oil export growth, only the Granger Test does marginally show 10% statistical significance. Other two tests are firmly rejected any causation effects. In a nutshell, no causation is found between real oil export growth and real output growth when annual data are used.

4.7 Conclusion and Policy Implications

The last section reports the empirical results of causal direction between exports and output growth. We divide real export sector into real non-oil and real oil export sectors. The main objective is to understand the causality between the two export sectors and economic growth. Methods of cointegration and three causality tests are employed to test the validity of export-led growth hypothesis.

In summary, there is a long-run cointegration relationship between non-oil real exports and economic growth. A bidirectional causation is found in these variables, when both quarterly and annual data are used. These two-way causality tests are at odds to the export-led hypothesis. On the other hand, it is shown that, when quarterly data is used for regression, it is the real oil export growth, which Granger-causes the real output growth; whilst there is no causal relationship when annual data are used. The export-led hypothesis, defined as a unidirectional causation from exports to output growth, is only valid in the oil-related industries in Indonesia when quarterly data are used. These empirical results have some policy implications for Indonesia's export sector:

1) The statistical significance of error-correction models in Table 4.4 confirm that the growth of non-oil real exports contribute to higher economic growth in the long run. The deregulation policies in the 1980s fostered non-oil export growth, whereas manufactured exports comprise 80% of non-oil exports (Anwar, *et. al.*, 1991). The year between 1986 and 1991 actually increased the non-oil exports. The comparative advantage of inexpensive labour cost not only contributes to low production cost, but also attracts foreign direct investment in the domestic market. Furthermore, industrialization in the non-oil export sector may increase domestic productivity and lessen dependence on oil-export earnings.

2) The oil-exports remains an important proportion of total exports in Indonesia, even though the economy has been undergoing structural change in recent years. The uni-directional causality between oil-exports and output growth provides a strong argument that the growth of oil-exports contributes to higher economic growth through foreign exchange earnings. The evidence is found in Xu (1996) as he classifies Indonesia as an outward-oriented with resource-based exporting country, which is in accordance with trade policies and the composition of exports. Since oil-exporting commodities provide considerable government revenue and foreign earnings each year, a stable oil pricing policy will alleviate budgetary and debt problems. However, the interpretation must be read with caution: 1) there is only 10% statistical significance in two out of three causality tests found in Table 4.5. A weak causal relationship is established; 2) there is no causal relationship found when annual data are used. It seems that oil export growth may not contribute higher economic growth in the long run. This can be shown that (in Figure 2.1) the share of oil to GDP growth has been actually falling since 1990. The Indonesian government cannot depend on oil revenue for supporting national income growth. The oil price per barrel was actually falling since the early 1980s.

3) High economic growth has been experienced in East Asia in the early nineties. With a large pool of population such as Thailand, Malaysia, and China in the region, trade liberalization will generate more investment opportunities and promote higher consumption demand. Not only does the manufacturing commodities export to the industrialized counties (Table 4.1), much of the intra-regional trade is fostered the region. As one of the ASEAN members, Indonesia will benefit from free trade and open market. Both oil and non-oil exports, therefore, facilitate large consumption demand in the region.

4) Further liberalization will contribute to continual economic growth. Liberalization includes trade, legal, investment, foreign exchange and financial system. However, the scope of liberalization should be gradual and any sudden and harsh measures easily distort the development of the financial system.

5) Evidence shows that Indonesia experienced high inflation and trade imbalances in the late 1980s (Parker 1991). Inflation was 9% in 1990. Exports growth increased by 16% and imports by 33.5%. Therefore, financial liberalization must be associated with economic stabilization policies. Dornbusch and Reynoso (1989) claim that unless financial factors are very distorted, financial liberalization does not make any difference in the GDP per capita. They assert that a poor fiscal record during financial liberalization is the major cause for instability and high inflation. And hence, they advise that government should maintain a stable exchange rate, a balanced budget and favourable investment climate.

6) Favourable investment climate provides the main justification for attracting foreign investment. The 1986 investment reform allowed 95% foreign ownership for export oriented foreign investments. The joint venture introduced in the export credit scheme could also facilitate more direct foreign investment. The attraction can advance Indonesia's transformation from labour-incentive to capital-incentive industries. Industrial development generates higher productivity and output. The progress will narrow regional economic imbalances and make domestic commodities more competitive in the international market.

7) The emergence of capital market is the core for the innovation of the financial system. A set of reforms has commenced in 1987. Increase in capitalization can provide capital inflows into the emerging equity market. A solid and mature capital market is indispensable to the growth of trade and finance.

Notes

1. The studies include Emery (1967); Maizels (1968); Voivodas (1973); Michaely (1979); Balassa (1978, 1984); Williamson (1978); Fajana (1979); Feder (1983); Schenzler (1982); Kavoussi (1984); Jung & Marshall (1985); Moschos (1989) and Salvatore (1989). Only the last three studies were written after 1985.

2. Outward-oriented are the countries with positive RCD. According to Singer and Gray (1985), RCD is a combined indicator of the effect of trade policy. It measures the extent to which a country has been able to enhance export performance through export competitiveness (RC) and diversification(RD). Therefore, RCD = (1 + RC)(1 + RD). (p.396)

3. The description code of each variable is as follows:

variable	code	origin
OEX	1AADYQ	BOP
NOEX	1AADXQ	BOP
Y	99BZF	IFS

4. The Akaike Information Criterion (AIC) function is shown as:

$$N \log(RSS) + 2K$$

where N is the number of regressors, RSS is residual sum of squares and K is the number of observations. The number of lag length is selected by minimizing the AIC function.

5. The cointegration equation can be regressed as:

$$X_t = \psi_0 + \psi_1 y_t + \mu_t$$

where y_1 is the cointegrating vector and μ_t is an error term and possessed to be an i.i.d.. If the two time series X_t and Y_t are cointegrated, the estimated residual will be stationary, i.e. $\mu \sim I(0)$.

6. Granger argues that original causality test is invalid when the two time series are cointegrated with the same order. It is because an error-correction term is not included in the tests, which capture the short and long run dynamic in the equation (see Granger 1988).

7. In this equation, $z_t = x_t - Ay_t$, it states that if x_t and y_t are I(1), there will have a linear combination such that $x_t - Ay_t = 0$ and $z_t \sim I(0)$.

8. The three variables are tested for stationarity by applying Augmented Dickey-Fuller (ADF) and Philips and Perron (PP) statistic. It is confirmed that the variables in I(1) process and I(0) after first-differencing.

Table 4.1 A Summary of Empirical Studies on Export and Output Growth

Author(s)	Data Set	Empirical Technique(s)	Other Variables	Conclusions
Ram (1985)	1960-1977 (73 countries)	OLS[a]	labour; capital; dummies	support EP
Ram (1987)	1960-1982 (88 countries)	OLS	investment-output ratio; labour; export growth times export-output ratio; government size	support EP by using time series methods; government size has an important effect on growth but there is hardly change in the significance of the export variable when cross-section method is used
Jung & Marshall (1985)	1950-1981 (37 countries)	Granger causality test		weak support for EP and cast doubt on the efficacy of EP strategy
Darrat (1987)	1955-1982 (4 countries)	White's causality test	no other variables but using 3 indicators of export performance	not support for EP in the case of Hong Kong, Singapore and Taiwan but Korea.
Gonçalves & Richtering (1987)	1960-1981 (70 countries)	rank correlation; OLS; cluster analysis		mixed evidence reflecting oversimplification and ahistoricism by applying bivariate tests
Chow (1987)	1960s-1970s (8 countries)	Sims Causality test		not only support for EP and also leads to structural transformation of the LDCs
Singer & Gray (1988)	1977-1983 (52 countries)	rank correlation	productivity; terms of trade; dummies	high growth rate of export earnings only due to strong external demand. EP is not a universal recommendation
Kunst & Marin (1989)	1965-1985 (1 country)[@]	causality tests[b]	labour; capital	no causality implied by export-led growth but there is a causal link from productivity to export

cont'd

Author(s)	Data Set	Empirical Technique(s)	Other Variables	Conclusions
Moschos (1989)	1970-1980 (71 countries)	Quandt's switching regression		support EP for both 'more advanced' and 'less advanced' developing countries
Bahamani-Oskooee & *et.al.* (1991)	24-37 years (20 countries)	Granger causality test		some support for EP
Marin (1992)	1960-1987 (4 countries)[@]	cointegration and Granger test	labour productivity; terms of trade	EP also favours industrialized countries
Serletis (1992)	1870-1985 (1 country)[@]	cointegration and Granger test	imports	GNP trend is not linear combination of the export and import trends, but the findings support EP
Sheehey (1992)	1960-1981 (53 countries)	OLS	domestic investment to domestic product; labour; 3 alternate export variables	inconclusive results by using alternate export variables
Ghartey (1993)	1955-1991 (3 countries)	Hsiao's causality test; Wald and likelihood ratio tests	terms of trade, capital stock	mixed results
Oxley (1993)	1865-1985 (1 country)	cointegration and Granger test	error-correction term	no support for EP
Bahamani-Oskooee & Alse (1993)	1973-1988 (9 countries)	cointegration	error-correction term	strong support for EP

[a] OLS represents ordinary least square test;
[b] causality in an unrestricted vector autoregression (UVAR) and subset model antoregression (SMAR) framework.
[@] industrialized country(ies)

Table 4.2 Unit Roots Tests

Variable	ADF	(*l*)	PP	(*tl*)
NOEX	-3.0230 (0.1239)	4	-15.0438 (0.1839)	4
OEX	-1.1284 (0.9242)	2	-6.2418 (0.7261)	2
Y	-2.1360 (0.4475)	5	-4.9787 (0.8135)	5
ΔNOEX	-4.9411* (0.0320)	2	-78.361* (0.0000)	2
ΔOEX	-4.5944* (0.0001)	3	-70.917* (0.0000)	3
ΔY	-4.7542 (0.000)	4	-61.599* (0.0000)	4

Notes: (1) significant at 5% level. (Davidson and MacKinnon 1993).
(2) [*l*] and [*tl*] represent lags and truncated lags of ADF and PP tests respectively.
(3) P-values are in brackets.

Table 4.3 Johansen Maximum Likelihood Cointegration Tests

Variables: Non-Oil Exports, Income

Max. Lags=4 Sample Size: 1975Q1-1993Q4

Maximal Eigenvalue Statistics

Null	Alternative	Statistic	95% Critical Value
$r = 0$	$r = 1$	14.3287*	11.0300
$r \leq 1$	$r = 2$	1.3144	4.1600

Trace Statistics

Null	Alternative	Statistic	95% Critical Value
$r = 0$	$r \geq 1$	15.6430*	12.3600
$r \leq 1$	$r \geq 2$	1.3144	4.1600

Variables: Oil Exports, Income

Max. Lags=4 Sample Size: 1975Q1-1993Q4

Maximal Eigenvalue Statistics

Null	Alternative	Statistic	95% Critical Value
$r = 0$	$r = 1$	10.0653	11.0300
$r \leq 1$	$r = 2$	1.3303	4.1600

Trace Statistics

Null	Alternative	Statistic	95% Critical Value
$r = 0$	$r \geq 1$	11.3956	12.3600
$r \leq 1$	$r \geq 2$	1.3144	4.1600

note: " * " denotes significance at 5% asymptotic level.
The critical values are derived from Davidson and MacKinnon 1993.

Table 4.4 Results from the Error-Correction Models

	1st equation	2nd equation
Regressand	ΔNOEX	ΔY
Regressor	ΔY	ΔNOEX
z_{t-1}	-0.12008** [0.0852]	-0.22717* [0.0475]
LM - statistic for Σ(1-L) ΔNOEX	Chi-Sq(3) = 5.7116 [0.127]	Chi-Sq(3) = 2.3804 [0.497]
LM - statistic for Σ(1-L) ΔY	Chi-Sq(3) = 11.4017 [0.010]*	Chi-Sq(3) = 8.6076 [0.035]*
R^2	0.19615	0.23519
S.E. of Regression	0.05054	0.01212
Serial Correlation (LM version)	Chi-Sq(4) = 11.980 [0.018]*	Chi-Sq(4) = 3.1982 [0.525]
Functional Form (LM version)	Chi-Sq(1) = 0.6410 [0.423]	Chi-Sq(1) = 1.1055 [0.293]
ARCH (LM version)	Chi-Sq(4) = 3.0533 [0.549]	Chi-Sq(4) = 2.8444 [0.584]

Note: z_{t-1} is the error correction term. [•] represents P-value.
"*" & "**" indicate at 5% and 10% significant level respectively.

Table 4.5 Causality Test: Real Oil Export Growth Causes Real Output Growth

Method	Sample	R-Squared	Null Hypothesis = 0
Sims's Test	73	0.17069	F(2,67) = 2.6928 (0.0750)**
Geweke-Meese-DentTest	75	0.25930	F(2,67) = 1.6839 (0.1934)
Granger Test	77	0.62859	F(2,72) = 2.6645 (0.0765)**

Note: "**" significant at 10% level and (•) represents P-value.

Table 4.6 Causality Test: Real Output Growth Causes Real Oil Export Growth

Method	Sample	R-Squared	Null Hypothesis = 0
Sims's Test	71	0.31346	F(3,63) = 1.5207 (0.2178)
Geweke-Meese-DentTest	73	0.72197	F(3,62) = 1.3337 (0.2716)
Granger Test	76	0.19193	F(3,69) = 0.5154 (0.6730)

Table 4.7 Johansen Maximum Likelihood Cointegration Tests (Annual Data)

Variables: Non-Oil Exports, Income Max. Lags=2

Trace Statistics

Null	Alternative	Statistic	95% Critical Value
$r = 0$	$r \geq 1$	29.504*	23.830
$r \leq 1$	$r \geq 2$	4.1376	11.540

Variables: Oil Exports, Income Max. Lags=2

Trace Statistics

Null	Alternative	Statistic	95% Critical Value
$r = 0$	$r \geq 1$	21.368	23.830
$r \leq 1$	$r \geq 2$	3.9575	11.540

Notes: (1) *r* is the number of cointegrating vectors. (2) '*' indicates significance at 5%.
(3) The trace statistics is corrected for small sample bias (see Reimers, 1992).
The critical values are shown in Osterwald-Lenum (1990).

Table 4.8 Results from the Error-Correction Models (Annual Data)

	1st equation	2nd equation
Regressand	ΔNOEX	ΔY
Regressor	ΔY	ΔNOEX
z_{t-1}	-0.5761* [0.000]	-0.6239* [0.004]
LM – statistic for Σ(1-L) ΔNOEX	Chi-Sq(1) = 8.7280* [0.003]	Chi-Sq(1) = 4.1618* [0.041]
LM – statistic for Σ(1-L) ΔY	Chi-Sq(1) = 0.7938 [0.373]	Chi-Sq(1) = 0.0204 [0.886]
R^2	0.80428	0.60192
S.E. of Regression	0.10856	0.17402
Serial Correlation (LM version)	Chi-Sq(1) = 0.0015 [0.969]	Chi-Sq(1) = 2.3208 [0.128]
Functional Form (LM version)	Chi-Sq(1) = 1.9899 [0.158]	Chi-Sq(1) = 1.1182 [0.290]
Heteroscedasticity (LM version)	Chi-Sq(1) = 0.0996 [0.752]	Chi-Sq(1) = 0.2086 [0.648]
Normality (LM version)	Chi-Sq(1) = 1.1862 [0.553]	Chi-Sq(1) = 0.3683 [0.832]

Note: Z_{t-1} is the error correction term. [•] represents P-value.
"*" indicates at 5% significant level

Table 4.9 **Causality Test: Real Oil Export Growth Causes Real Output Growth (Annual Data)**

Method	Sample	R-Squared	Null Hypothesis = 0
Sims's Test	11	0.9580	F(2,5) = 1.5427 (0.3007)
Geweke-Meese-DentTest	13	0.9608	F(2,5) = 1.6968 (0.2739)
Granger Test	15	0.7796	F(2,10) = 1.9450 (0.1934)

Table 4.10 **Causality Test: Real Output Growth Causes Real Oil Export Growth (Annual Data)**

Method	Sample	R-Squared	Null Hypothesis = 0
Sims's Test	11	0.9562	F(2,5) = 0.2777 (0.7685)
Geweke-Meese-DentTest	13	0.9767	F(2,5) = 2.4799 (0.1786)
Granger Test	15	0.6860	F(2,10) = 3.8336 (0.0581)**

Note: "**" significant at 10% level and (•) represents P-value.

Chapter 5 Export Growth and Real Exchange Rate Volatility: A Cointegrated VAR Approach

5.1 Introduction

In this chapter, we examine the effect of real exchange rate volatility on exports in Indonesia. This study aims to provide support for the Indonesian monetary authorities of pursuing a stable real exchange rate in order to promote an export-led growth.

Various studies have been done on this issue. For example, Grobar (1993) shows that some categories of LDC manufactured exports are negatively affected by real exchange rate uncertainty. It especially highlights that firms, which are highly sensitive to changes in the level of the real exchange rate, are most likely to be negatively affected by increases in real exchange rate uncertainty (p.375). Pozo (1992) applies the GARCH technique to measure exchange rate volatility. Based on the annual data of British exports to the US between 1900 to 1940, he finds that volatility of the real exchange rate has a depressing effect on the volume of trade in the early 1900s. Koray and Lastrapes (1989) investigate the impact of real exchange rate volatility on the US bilateral imports. They find that the effect of volatility changes with exchange rate regimes; and the permanent shocks to volatility tend to depress imports. In another paper, Lastrapes and Koray (1990) relate exchange rate volatility, international trade and the other macroeconomic series in the context of a VAR model. The exchange rate volatility is estimated by a moving sample standard deviation of real exchange rate changes. They find some evidence of a negative relationship between volatility and trade variables in the US macroeconomy.

In a multivariate error-correction model, Chowdhury (1993) concludes that exchange rate volatility has a significant negative effect on the volume of exports for the G-7 countries. In most of the cases, the coefficients on foreign income in the ECM equations are larger than those on the relative price, indicating a faster response of export volume to foreign income changes than to relative price changes. Arize (1995) examines the effects of exchange-rate volatility on the US exports. He measures the exchange rate uncertainty based upon Engle's ARCH model and confirms that uncertainty has a negative effect on the US real exports. On a micro level, Manzur (1993) explains why firms like hedging against unforeseeable exchange rate fluctuation that impedes the volume of international trade.

The conclusion, however, should not be drawn one-sidedly. Asseery and Peel (1991) investigate the impact of exchange rate volatility on exports. Upon several experiments, they find that it is preferable to use the squared residual from ARIMA process to conditional variances based on ARCH models for measuring real exchange rate volatility. The results show that exchange rate volatility proves to have a positive relationship with export growth in four out of five developed countries.

Like other Asian countries, Indonesia has been launching a series of trade and financial programmes to promote exports economic growth. Binhadi (1994) argues that devaluation policy in the early eighties was aimed to improve Indonesia's export competitiveness, increase foreign exchange earnings, and stimulate foreign capital investments. Hence, one of the government policies is to maintain real exchange rate stability so as to smooth out export fluctuation. Knowing the export-real exchange rate relationship, it helps to understand the impacts on trade liberalization and other regulatory policy reforms introduced in mid-eighties in Indonesia, especially in the growth of manufactured exports. The stabilization of real exchange rate is a policy instrument to minimize export fluctuation. It is hypothesized that a stable exchange rate policy can facilitate export performance and attract foreign trade and investment in the area of manufactured production in Indonesia.

Some problems regarding the export-exchange rate policies in Indonesia have to be resolved: 1) In the macroeconomic aspect, what are the determinants of Indonesia's export function? 2) Does real exchange rate volatility account for export fluctuation? 3) If so, to what extent is the fluctuation of export caused by real exchange rate volatility/shock? 4) Is there any difference between the short-run and long-run dynamics of exports and real exchange rate volatility? 5) What are the implications of exports on intra-regional trade? Since there is no other work attempting to answer the above questions, this paper aims to shed some light on the export-exchange rate relation in Indonesia.

A cointegrated vector autoregression (VAR) approach is used to investigate the export-real exchange rate relation. A standard Sims (1980) VAR model rather than a restricted VAR is employed in which all variables are jointly determined and there is no *a priori* assumption for the exogeneity of any variables in the system. The VAR method also explains dynamic interrelation among the variables. Hence, the dependence of a rigid, sometimes inappropriate, structural model can be avoided (Koray and Lastrapes, 1989; Lastrapes and Koray, 1990).

The interrelationship among economic series is examined through the impulse response function and forecast error variance decomposition techniques. Since most of the macroeconomic time series are non-stationary, special attention should be paid when dealing with random walk properties. Therefore, unit root methodology is applied for testing the series. Engle and Granger (1987) argue that if two series are said to be cointegrated, there exists a linear combination of the variables, which will converge to a long-run dynamic equilibrium, even though each variable is individually non-stationary. However, Lütkepohl and Reimers (1992) show that if more than one cointegrating vectors are found, it is often difficult to interpret the cointegration relation directly. They develop the asymptotic distribution of the impulse responses and forecast error variance components of a Gaussian VAR process with multiple equilibria cointegrated systems. The theory is derived from Johansen's (1988, 1989) maximum likelihood estimation procedure.

The paper studies the relationship between Indonesia's export growth and real exchange rate volatility. First, the non-stationary integrated properties of real exports and its determinants are examined. A trade-weighted Indonesian export function is estimated in the first place. The indices are calculated from Indonesia's four biggest export trading partners. Second, a moving average of real exchange rate volatility is calculated as a proxy for measuring exchange rate uncertainty. Third, a cointegrated vector autoregression (VAR) approach is used to investigate the effect of real exchange rate volatility on exports through the application of impulse response function and forecast error variance decomposition technique. Fourth, an error-correction (ECM) model and Wu-Hausman exogeneity test are used to investigate the short-run dynamic export function and to test the exogeneity of volatility in the ECM model respectively. Fifth, to further understand the effects of real exchange rate volatility on Indonesia's export trade, we estimate four export demand functions of Indonesia's trading partners individually. This may provide greater insight for export-exchange rate pattern with Indonesia's four biggest trading partners.

The plan of the paper is as follows. Section 2 explains the determinants of the export function. Section 3 shows the formation of data set. Section 4 explains the methodology. Section 5 reports the empirical results. Section 6 demonstrates individual pattern of export-real exchange rate volatility of Indonesia's four biggest trading partners. The last section gives the concluding remarks and suggests on future research.

5.2 Determinants of Export Demand Function

Following the conventional approach, real exchange rate volatility, relative export prices and foreign income are considered to be the possible determinants to modeling the export function. The theoretical aspect of each variable is shown as follows:

Real Exchange Rate Volatility

Suppose a real export exchange rate measures the nominal exchange rate of two countries over relative export price indices. In logarithmic form,

$$r_t = s_t + p_t^* - p_t \tag{5.1}$$

where r_t is the real export exchange rate, s_t is the value of Rupiahs per foreign currency, p_t^* and p_t are the foreign and domestic price indices respectively. Assuming that foreign and domestic export goods are imperfect substitutes, a rise (shock) of foreign export price relative to domestic export price will cause a positive relative price change, $(p_t^* - p_t)$, which leads to a depreciation of the real export exchange rate (a rise in r_t). A rise of nominal exchange rate, s_t, also produces the same effect on (rise) real exchange rate. Any real exchange rate change influences both the price and quantity of domestic exportables. The degree of the change depends on market structure, price and income effects and the exchange rate regime.

In modelling the export function, the effects of *(log)-level* of real exchange rate is different from the *uncertainty* of the real exchange rate. The *log-level* only shows the size of effects and the elasticity of real exchange rate on export. The export elasticity depends on the percentage change in exports resulting from a given percentage change in real exchange rate. The *uncertainty*, however, includes the time-varying factor of exchange rate on exports. Most empirical work considers exchange rate uncertainty as a risk. The risk-averse firm will produce less output when exchange rate risk is too high or hedging is impossible. Since risk is counted as a cost of production, hypothesis states that increased uncertainty (volatility) causes diminished trade (Lastrapes and Koray (1990). Firm behaviour therefore will be dependent to the level of exchange rate uncertainty. Grobar (1993) argues that the relationship between price uncertainty and output behaviour is particularly relevant for exporting firms in countries with highly unstable real exchange rate (p.368).

We use real exchange rate volatility as a proxy for measuring exchange rate uncertainty. Papers like Bahmani-Oskooee (1986), Tegene (1989) and Deyak *at el.* (1993), using the *log-level* or the *change* of real exchange rate are not recommended. First, it cannot account for exchange rate uncertainty; Second, export demand function exhibits serious dynamic misspecification and becomes structurally unstable when exchange rate uncertainty is included (Arize, 1995); Third, exchange rate volatility is time-varying, simply using the *level* or the *first differencing* of real exchange rate cannot capture the high and low exchange rate uncertainty. Following Kenen and Rodrik (1986), Koray and Lastrapes (1989), Lastrapes and Koray (1990), Chowdhury (1993), and Asseery and Peel (1993), the measurement of real exchange rate volatility is as follows:

$$V_t = \left[(1/m) \sum_{i=1}^{m} (R_{t+i-1} - R_{t+i-2})^2 \right]^{1/2} \tag{5.2}$$

where V is volatility, R is the log real exchange rate, m is the order of moving average. By not reducing the number of observations, the value of m for quarterly data is set to 4. It is noted that, as in Pozo (1992) and Arize (1995), ARCH and/or GARCH techniques are used to measure volatility. The observation shows that the conditional second moment (ARCH / GARCH) seems to be more relevant than the unconditional measures of exchange rate uncertainty. However, results obtained by Pozo and Arize do not show any differences regardless what particular measure of volatility is used. Baillie and Bollerslev

(1989a) indicate that only with high frequency data ARCH and GARCH effects show any significance. Since we are using quarterly data, our measure of volatility seems appropriate for application.

Relative Export Prices

The relative export prices show the logarithm of Indonesian (domestic) export price relative to foreign export prices. In an aggregated level, foreign export prices are trade-weighted foreign export prices. The sign of the relative prices is inconclusive. The conventional expected sign of the relative prices is negative, since a rise in foreign export prices relative to Indonesian export prices, *ceteris paribus*, increases the volume of Indonesian exports. This corresponds to the arguments of Riedel (1988) and Tegene (1989) that a small exporting economy is facing a low price elasticity of export demand function, since a small exporting developing country is unable to influence world prices for the goods it exports.

However, Muscatelli *et al.* (1994, 1995) find high price elasticities of manufactured export demand in some Asian Newly Industrialized economies. They argue that non-price factors such as product innovations and technology have important influence in those fast-growing economies. Hence, the exclusion of product innovation in the conventional export demand function will result at low price elasticity. Moreover, Mukerjee's (1992) multisectoral model shows that some of India's fastest growing exports are able to overcome low price elasticities as they grow proportionately faster than the volume of world trade (p.516). Hence, if Indonesian export goods are complements for foreign goods, say, Indonesia supplies semi-finished components to foreign markets, then a fall in foreign export price will lead to an increase in demand for foreign goods and the Indonesian components. The expected sign of the relative price becomes positive.

Foreign Income

The relationship between foreign income and domestic export has long been documented in a standard Keynesian model. A rise in foreign income, *ceteris paribus*, will increase demand for exports from other countries. Therefore, the income elasticity of export demand is expected to be positive. Runstler (1994) examines the long-run impact of foreign shocks to the Austrian economy. He argues that shocks to European OECD GNP have a high long-run impact on sectoral output, especially in the export dependent sectors. The proposition supports the export-led growth hypothesis.

Since a standard VAR is a reduced form model, the export demand function is shown as follows:

$$\text{exports} = f(\overset{-}{\text{real exchange rate volatility}}, \overset{-/+}{\text{relative export prices}}, \overset{+}{\text{foreign income}}) \tag{5.3}$$

5.3 Data

Indonesia's main four export trading partners, the US, Japan, Singapore, and Korea are selected to construct an aggregate export demand function.[1] The data are extracted from *CD-Rom,* International Financial Statistics. The variables are volume of exports, real exchange rates, relative export prices and gross domestic products (GDP). The construction of real exchange rate volatility is based on Eq.5.2. The sample period is from 1974Q1 to 1993Q1. The real exchange rate is the value of Rupiahs per foreign currency multiplied by the relative consumer price indices. Since there are no quarterly GDP data, we adopt method from Goldstein and Khan (1976) to interpolate quarterly observations. All data series are in natural logarithms and are converted into Rupiahs. A description of the data is given in the note.[2]

5.4 Methodology

5.4.1 Cointegrated VAR

The speed adjustment from short-run to long-run equilibrium space and the change of structural parameters make a structural model empirically difficult. The VAR modeling therefore provides a standard reference to assess the economic interdependence of macroeconomic variables. Unlike a standard macro-structural model, VAR technique does not apply *a priori* spurious structural restrictions but performs an unrestricted dynamic data representation. Chishti *et. al.* (1992) indicate the difference between a standard macroeconomic modeling and a VAR modeling. They argue that 'unlike the structural model, the VAR system is based entirely on empirical regularities embedded in the data. While the structural model is tied closely to the economic theory and has to follow the assumptions and the *a priori* restrictions imposed therein, the VAR model does not have to resort to the theory *per se* as, in fact, the data determines the final system.' Moreover, the lag structure of a VAR model is regarded as a proxy to account for the role of expectational dynamics, transaction cost adjustments and persistent random walk disturbances (Keating, 1990). Arize (1995) argues that if the exchange rate volatility is due to economic fundamentals, efforts by the authorities to reduce it by means of exchange controls or other restrictions on trade could be more harmful to trade and could reduce it more. Hence, the effect of volatility on export cannot be determined *a priori*, but it is rather an empirical matter (p.36). The objective of the paper is to find the historical relationship among those variables which may result in the understanding of economic theories. Sims (1980) and later Litterman and Weiss (1985) initially advocate the VAR methodology. The methodology has been broadly used to investigate the responsiveness by means of innovation accounting, i.e. impulse responses and variance decomposition analysis. It can be used to obtain information concerning the interrelationships among variables (Lütkepohl and Reimers, 1992).

Since most of the macroeconomic series are non-stationary, the unit root econometrics is used for the application of cointegration analysis. However, Stock (1987) and Phillips (1991) have shown that simple first differencing of VARs cannot provide sufficient explanation for the sets of non-stationary series that are found to exhibit cointegrating relationship. Hence, cointegration means a group of integrated variables which linear combinations are stationary. The cointegrating relationship represents the long-run equilibrium and any shocks to variables should restore to the long-run relationship.

In their paper, Lütkepohl and Reimers (1992) show that it is often difficult to interpret more than one cointegrating vectors directly within a cointegrating system. Having derived the asymptotic theory from Johansen's (1988, 1989) maximum likelihood estimation procedure, they provide the asymptotic distribution of the impulse responses and forecast error variance components of a Gaussian VAR process with cointegrated variables. Moon and Jain (1995) assert that this VAR modeling is very powerful and flexible as it can accommodate a stationary VAR, differenced VAR and a cointegrated VAR system. The cointegrated VAR approach, therefore, can reveal dynamic transmission effects of time series data.

5.4.2 Johansen's Cointegration Estimation

The advantage of using multivariate cointegration is that there is no *a priori* assumption on the uniqueness of the cointegrating vector(s). Moreover, Johansen's test can eliminate biases against small sample measurement errors. Consider an n-dimensional VAR:

$$X_t = \Pi_1 X_{t-1} + \Pi_2 X_{t-2} + \ldots\ldots\ldots\ldots + \Pi_k X_{t-k} + e_t \tag{5.4}$$

where X is an nx1 random vector in I(1) order and t = 1,..., T. e_t is i.i.d.. Since Eq.5.4 appears to be non-stationary, a first difference form is written as:

$$\Delta X_t = \sum_{i=1}^{k-1} \Gamma_1 X_{t-i} - \Pi X_{t-k} + \mu \tag{5.5}$$

where

$$\begin{aligned} \Gamma_i &= -I + \Pi_1 + \ldots\ldots \Pi_i, \\ \Pi &= I - \Pi_1 - \ldots\ldots\ldots \Pi_k \end{aligned} \tag{5.6}$$

The test is to examine nxn Π matrix. When the matrix has a full rank n, the elements of series X are stationary. If the element of series X has the rank such that rank(Π) = $r < n$, there are r cointegrating vectors among the elements of series X and n - r common stochastic trends. The matrix P can be decomposed into two matrices α and β:

$$\alpha\beta' = \Pi \tag{5.7}$$

β is the cointegrating vector that analyses the long-run relationship of the series X and α is the adjustment vector that captures the speed of adjustment. The maximal likelihood and trace test procedures of Johansen's multivariate cointegration technique are used.

5.4.3 Impulse Response Function

Lütkepohl and Reimers (1992) argue that it is misleading to interpret the cointegrated relations individually if there are more than one cointegrating vectors in a system.[3] It is more appropriate to use impulse response function to analyze the multi-cointegrated vectors. The impulse response function can be used to obtain information about the interactions among the variables. Based on Johansen's maximum likelihood procedure, the impulse response function provides short-run and long-run linkages among variables.[4]

The impulse response function, expressed in a moving average representation, is used to obtain the response of variables to one standard deviation unit of shock (i.e. innovation) in each equation. Given a VAR system, a moving average representation is shown as:

$$Y_t = \sum_{s=0}^{\infty} A_s \varepsilon_{t-i} \tag{5.8}$$

Y is an N-variate stochastic process and it is a linear combination of current and past one-step-ahead forecast errors, i.e. innovations, ε_t. It tells how the response of an ith variable to one unit shock in a jth variable in A_s after s periods. In other words, ε_t is called the innovation process of Y. For a k step-ahead forecast error of Y, the model is:

$$\sum_{s=0}^{k-1} A_s \varepsilon_{t-i} \tag{5.9}$$

5.4.4 Forecasting Error Variance Decomposition

The forecast error variance decomposition shows the proportion of movement of a variable, which is attributed to its 'own' shock or shocks from other variables. The technique helps to understand the interrelationship among the variables in the system. If there are two series, $\{x_t\}$ and $\{y_t\}$, a shock $\{e_{xt}\}$ explains none of the forecast error variance $\{y_t\}$ at all forecast horizon, the variable $\{y_t\}$ is said to be exogenous. That is, the forecast error variance of $\{y_t\}$ is fully explained by its own innovation. In another extreme case, $\{y_t\}$ is said to be endogenous if a shock $\{e_{xt}\}$ can fully explain its forecast error variance at all the forecast horizon. Therefore, the VAR estimation provides useful insight of the dynamic interactions among variables.

Since the residuals in the VAR system may be contemporaneously correlated across equations, the Choleski decomposition is used to orthogonalize the residuals[5] such that the transformation produces contemporaneously and serially uncorrelated innovations.

5.4.5 Model Specification

Based on the methodology discussed above, We will first model an aggregate export demand function of Indonesia. The matrix form of short-run dynamic VAR model is shown as follows:

$$Y_t = C + B(L)Y_t + e_t \tag{5.10}$$

where Y_t is a $k \times 1$ vector of system variables, C is a $k \times 1$ is vector of constants, B(L) is $k \times k$ matrix of polynomials in the lag operator (L), and e_t is $k \times 1$ vector of white noise innovation terms. In a standard unrestricted VAR model, all equations have the same lag length so that the polynomials of B(L) are of the same degree. Since each equation has the same length, the system can be estimated by OLS as the estimates are consistent and asymptotically efficient (Enders, 1995). The optimal lag length of the VAR system is determined by Schwert's method (1987). In Eq.5.10, foreign income is treated as an exogenous variable.

The results of the VAR system may be sensitive to the ordering of the variables. If the residuals in the VAR system are contemporaneously correlated across equations, the ordering of the variables may lead to different impulse response outcomes. The concept of the generalized impulse response function therefore is to solve the problem of the dependence of the orthogonalized impulse response functions on the ordering of the variables in the VAR system (Koop *et. al.;* 1996; Pesaran and Pesaran, 1997). If the off-diagonal error variance matrix for the VAR system, using the log-likelihood statistic, is found to be contemporaneously uncorrelated, Pesaran and Shin (1997) show that the generalized impulse responses and the orthogonalized impulse responses are exactly coincide, which are invariant to the ordering of the variables in the VAR system. Testing the contemporaneous correlation of off-diagonal error variance matrix is used by the log-likelihood ratio statistic and such that

$$LR(H_0 \mid H_1) = 2(LL_u - LL_R) \tag{5.11}$$

where LL_u and LL_R are the maximized values of the log-likelihood function of H_1 (unrestricted model) and H_0 (restricted model) respectively. LR is asymptotically distributed as a chi-square with n degrees of freedom. Hence, we will take account of these concepts and compute the response functions accordingly.

5.5 Empirical Results

5.5.1 Aggregate export demand

5.5.1.1 Unit Root Tests

Table 5.1 reports the Augmented Dickey-Fuller (ADF) unit root test results.[6] The variables are real exchange rate volatility, relative export prices, foreign income and exports. Both the *level* and *first difference* of the variables are reported. All the series are in logarithms. The null hypothesis is the presence of a unit root, and the failure to reject the null means that the variable is non-stationary. The statistical significance level is referred to Cheung and Lai (1995) and such that response surface analysis is used to obtain approximations to the finite-sample critical values for the ADF test. The null hypothesis of a unit root cannot be rejected at 5% significance level. The presence of a unit root is further confirmed by testing the variables at their first difference, and the null hypothesis is firmly rejected. All variables therefore, appear to be integrated of order one, i.e. non-stationary at level but stationary at first difference.

5.5.1.2 Johansen's Cointegration Analysis

Table 5.2 reports Johansen's maximum likelihood procedure for cointegration analysis. Both maximum eigenvalue and trace statistics are presented. For the maximum eigenvalue statistic, the alternative hypothesis is that there exists r cointegrating vector(s) in the system, where r is the number of cointegrating vectors that are to be determined by the rank of the long-run impact. For trace statistic, the alternative hypothesis is the existence of at most r cointegrating vector(s) in the system. If P is a null matrix and r = 0, there is no long run relationship among the variables in the system (Eq.5.6). The number of lags is set to 3 by using Schwert's (1987) method.[7] The 95% and 90% critical values are given in Osterwald-Lenum (1990). For maximal eigenvalue statistic, there are two cointegrating vectors significant at 10% level; whilst for trace statistic, there are at most two cointegrating vectors significant at 5% level. The two statistics confirm that the null hypothesis of no cointegration is rejected and there are two cointegrating vectors existing in the system. It means that exports, real exchange rate volatility, relative export prices and foreign income are cointegrated within the system, indicating a long-run relationship being held in the Indonesian economy between 1974 and 1993.

Table 5.3 shows the normalized cointegrated vectors derived from the Johansen's maximum likelihood method. The dependent variable, exports, is normalized to minus one.[8] The normalized cointegrating vectors indicate the long-run relationships between exports and the other variables. Hence the normalized cointegrating relations with respect to exports are,

$$\text{Vector 1:} \qquad Ex = -2.091Volat - 4.310RP + 1.342Y^* \tag{5.12}$$

$$\text{Vector 2:} \qquad Ex = -0.225Volat + 0.228RP - 0.301Y^* \tag{5.13}$$

The interpretation is that an 1 percent increase of volatility would lead to 2.091 and 0.225 percent reduction of exports in Eq.5.12 and Eq.5.13 respectively. The relationship shows that real exchange rate volatility is negatively related to the volume of exports. From the view of error-correction mechanism, the relative large coefficient of volatility of the first vector explains bigger movement required to return to the long-run equilibrium; whilst the size of the coefficient of the second vector is relatively small once there is a disturbance. Even though the size of relative change varies, it confirms the hypothesis that a rise in volatility increases exchange rate risk and hence impedes international trade.

The relative prices are in general negatively related to exports. A rise in foreign export price to Indonesian export price causes relative prices to become smaller, shifting domestic export demand to the right, and *ceteris paribus*, will increase the volume of exports. However, if Indonesian goods are complements for foreign goods, say, Indonesia supplies semi-finished components to foreign markets, then a fall in foreign export price will lead to an increase in demand for foreign goods and Indonesian components. Hence, there is an expected increase for Indonesian exports to the foreign markets. As seen, the two cointegrating vectors of relative prices have opposite signs. Indeed, understanding the types of Indonesian exports is important to estimate the role of the trade flows with its major partners.

The signs of foreign income are ambiguous. A rise in foreign income normally increases demand for Indonesian exports. The export-foreign income relationship is positive. An opposite sign may indicate an alternative explanation. A rise in foreign income accelerates a foreign country's domestic consumption, causing higher demand for non-tradables relative to tradables. In this case, Indonesia's export growth will be limited.

To further study the relationship between exports and real exchange rate volatility we impose a single restriction on the cointegrated vectors as proposed by Johansen (1992). For example, using log likelihood ratio we test the restriction that the coefficient of the real exchange rate volatility is zero. The restriction is rejected and implies that the presence of volatility is detrimental to international trade (see Table 5.3). For relative prices and foreign income, on the other hand, zero restrictions are not statistically significant. However, one should bear in mind that the restriction tests are actually based on a group of cointegrating vectors and it is difficult to interpret the two relations individually in the long run which may lead to different individual effects. This caveat is mentioned by Lütkepohl and Reimers (1992).[9] Moreover, Lütkepohl and Reimers (1992) argue that the estimate of the long run matrix, P, cannot tell much about the interaction among the macro-variables even though the relationships do consistently follow the long-run linkages.[10] They suggest the multiple cointegrating relationship be interpreted in the light of impulse response function. Hence, we will show the results of both impulse response analysis and forecast error variance decomposition in the following sections.

5.5.1.3 Impulse Response Analysis

The impulse response analysis is used to examine the direction of effect and speed of transmission among variables in the system. The VAR ordering is set to 20 quarters, this length is long enough to analyze the short-run (1 quarter ahead), medium-run (4 or 8 quarters ahead) and long-run (20 quarters ahead) dynamics (Blanchard and Watson, 1986). The optimal lag level is 3 which is determined by Schwert's (1987).

The conventional practice to choose the ordering of the variables is motivated by economic theory, prior to orthogonalization.Since the vector of error term may be contemporaneously correlated, the Choleski orthogonalization procedure is applied to eliminate any contemporaneously correlation between any innovation series. If the residuals of the variables in the VAR system across equations are contemporaneously correlated, then the generalized impulse response function is used for computation. Pesaran and Shin (1997) and Koop & *et. al.* (1996) show that the generalized and orthogonalized impulse responses coincide if the off-diagonal error variance matrix are contemporaneously uncorrelated. Hence the generalized impulse response function is to solve the problem of dependence of ordering of variables in the VAR systems. Table 5.4 shows the test of contemporaneous correlation of the off-diagonal error variance matrix. The test is to use the log-likelihood ratio statistic. The null hypothesis is that equations in the system are contemporaneously uncorrelated against the alternative hypothesis of contemporaneous correlation. The LR is 164.36 as a χ^2 variate with 4 degree of freedom. The null hypothesis is firmly rejected. In this case, we use the generalized impulse response functions to circumvent the problem of the dependence of the orthogonalized impulse responses on the ordering of the variables in the VAR.

Figures 5.1 to 5.2 show the generalized impulse response of exports due to one standard deviation shock in real exchange rate volatility and relative prices, treating foreign income as an exogenous variable. Since the variables are I(1), '*first difference*' of the variables are appropriate to be used.[11]

According to Lütkepohl and Reimers (1992), the effect of a one-time impulse on a variable can be described as transitory if the variable returns to its previous equilibrium value of zero (if equilibrium is originally placed at zero) after some periods. If the variable does not return and stay at a new equilibrium level, the effect is called permanent (p.70). A standard deviation shock of real exchange rate volatility reduces the volume of exports from the origin (when quarter = 0). Exports begin to fall immediately in the first quarter. It then rises and falls again from the second quarter. The response becomes die down after the 10th quarter. Blanchard and Watson (1986) refer this scenario as the medium-run dynamics of the VAR. Real exchange rate volatility dampens exports especially in the short-run. It partly explains why firms would like hedging against unforeseeable exchange rate fluctuation that diminishes the volume of international trade (Manzur, 1993). The shock to exports is temporary and the tail dies down after 9 quarters.

The shock of relative prices to exports indicates that the shock has significant negative effect on export growth. The negative impact lasts about 3 quarters. It is not until after the 10th quarter does the impulse response die down over the longer horizons. The tail becomes flat eventually. Overall, the shocks to export are short-run and temporary, this is also consistent with the findings of a long-run relationship through the cointegration analysis.[12]

5.5.1.4 Forecast Error Variance Decomposition

The dynamic relationship between exports and real exchange rate volatility can be analyzed by the forecast error variance decomposition (VDC). The VDC shows the proportion of the forecast error variance due to its own shocks against other shocks in a system. Hence, the VDC of exports shows the size of forecast error variance of exports which can be explained by 'innovation' to real exchange rates and by 'innovations' of other variables. If real exchange rate volatility is an important component leading to the fluctuation of exports, the real volatility must play a significant part in forecasting error of export variance. Therefore, the VDC provides an indication of the relative importance of individual innovation in explaining the variation of exports. The quarters ahead are set to 20. Table 5.5 indicates the forecast error variance decomposition of exports explained by real exchange rate volatility, relative export prices and its own innovation. Our first task is to examine whether the export is an exogenous variable or not. For exogeneity, we refer to the error variance of export that can be fully accounted for by its own innovation. In the table, exports are explained by about 99 percent error variance of their own innovations in the first two-quarters. It indicates that the statistical nature of exports is very much exogenous in the short-run. The own innovations of exports decline to about 96 percent over the longer horizons ahead. The characteristic of exogeneity of exports remains strong.

The real exchange rate volatility has its role in the forecast error variance decomposition for exports. The error variance in the initial quarters ahead is trivial, but increases to over 3.5 percent after 5 quarters ahead and remains stable over longer horizons. The innovation of relative prices to exports is strong and it is about 8.5 percent over longer quarter ahead. Even the innovation of relative prices is greater than the innovation of volatility to exports, the presence of real exchange rate volatility in explaining the forecast error variance for exports cannot be neglected. The real exchange rate volatility provides one of the sources for export fluctuation.

5.5.2 Error Correction Model and Wu-Hausman Exogeneity Test

To further understand the short-run dynamic, an error correction (ECM) formulation of the dynamic model is constructed. The first feature is that if the variables are cointegrated, the ECM incorporates both short-run and long-run effects. Secondly, the error-correction term captures the path towards its long run growth equilibrium. Thirdly, all the terms in the model are stationary so that the use of a standard regression technique is valid. The final model is based on general-to-specificapproach such that only variables with statistical significance are presented in the model. Table 5.6 shows the pair of ECMs, which are the residuals of the two cointegrating equations. The model shows that the two ECMs, with one lag each, are statistically significant. However, only ECM1 has the correct sign and such that it takes 0.76% per quarter to return to the long-run path. The relative prices are significant but with alternative signs. Volatility, either contemporaneous or lagged by one quarter, shows significance with correct signs. Increase in real exchange rate volatility actually impedes export growth. The model seems fit well. The R-square is 0.9427. All the diagnostic tests including the Lagrange multiplier test of residual serial correlation (p-value = 0.411); Ramsey's RESET test for functional form (p-value = 0.3588); Normality test (p-value = 0.162); Heteroscedasticity based on the regression of squared residuals on squared fitted values (p-value =0.503) and ARCH effect (p-value =0.661); are not statistically significant at 5% level. Therefore, the ECM model confirms that there is a strong negative relationship between export growth and volatility.

To test the exogeneity of volatility in the ECM model, Wu-Hausman exogeneity test is computed. It is to test whether there is residual correlation between volatility and other variables. Instrumental variables are used for this test.[13] The Wu-Hausman statistic is equal to the value of Lagrange multiplier test, which is computed as 5.2714 with Chi-square(1). The significance confirms that the presence of volatility is residually uncorrelated with other variables in the system. It means that real exchange rate volatility is a driving force for export fluctuation. Hence, it further shows that real exchange rate volatility is a detrimental factor for export growth.

5.6 Estimation with Indonesia's Four Biggest Trading Partners

This section is to individually estimate the export demand functions for Indonesia's four biggest trading partners. The purpose is to understand possible Indonesia's export-trade effects from a country's real exchange rate volatility. This may provide further insight on export-exchange rate pattern to Indonesia's export trade.

The negative effect of exchange rate volatility on Indonesia's exports shown in the previous section does not necessarily hold on a country-by-country level. Hence individual export demand functions are estimated. Four biggest trading partners, in terms of export trade ranking with Indonesia, are the US, Japan, Singapore and Korea. The former two countries are the developed countries whilst the latter two are the developing countries. It is good to show whether the export-exchange rate pattern with might be different between developed and developing countries.

All the variables are first-difference stationary (not reported). Hence we can apply Johansen's trace statistics for cointegration. Table 5.7 shows the cointegration results. There are two cointegrating vectors found in the US and Japan, three in Singapore and one in Korea. The Table confirms that the variables are cointegrated within the system, indicating long-run relationships being held in Indonesia's four trading partners.

The normalized cointegrated vectors (βs) and the log likelihood test of restrictions of the four countries are reported in Table 5.8. The volatility vectors of Japan, Singapore and US have positive and negative signs; whilst Korea's is negative. The absolute values of vector 1 are usually larger than those of vector 2, indicating bigger influence of volatility on exports. Generally speaking, there is at least one real exchange rate volatility vector negatively related to exports.

Contrast to the aggregated level, the signs of relative price vectors of the four countries are positive. A positive relationship of relative prices and exports implies that the composition of Indonesian exports are semi-finished or high value added manufacturing products, such as exports of light industries.[14] Therefore, a fall in foreign export price will lead to an increase in demand for foreign goods and Indonesian components. Moreover, foreign incomes are generally positive related to exports except Vector 2 of the US. Increase in foreign income leads to higher demand for Indonesian exports which is in line with economic theory.

In most of the cases, the null hypothesis of zero restriction to variables is rejected. Zero restriction on volatility is firmly rejected in four countries. This indicates that real exchange rate volatility is the major variable in analyzing the export demand function.

Before turning to impulse response function, we have to test contemporaneous correlation of the off-diagonal error variance matrix for four countries. Table 5.9 reports that the null hypothesis of no contemporaneous correlation is rejected in Japan and Singapore. For the ease of comparison, we use the generalized impulse responses functions for computation.

Figures 5.4 to 5.7 show the generalized impulse response of exports to one standard deviation shock in real exchange rate volatility of the US, Japan, Singapore and Korea respectively. Except for Korea, one standard deviation shock in real exchange rate volatility causes a reduction of Indonesian exports to the US, Japan and Singapore within the first two horizons. The shock to Korea is positive and significant in the first two quarters and then moves downward. The shocks are overall quite short-lived and begin to die down after two years.

In view of the generalized forecast error variance decomposition of exports, Table 5.10 shows the innovations of variables to exports over 20 quarters ahead. The innovation in volatility to exports is the highest in Japan (0.6577 at 20 quarters ahead), then Korea (0.2276), the US (0.1671), and lastly Singapore (0.0884). It is interesting to know that exchange rate volatility attributes for the highest innovation in Japan. The results are in line with Kwan's argument (1994) that the economic influence of Japan to East

Asia is prevailing and the deepening of intra-regional interdependence is evident. Indonesia exports raw material and oil products to and imports semi-finished products and consumption goods from Japan. Kwan called this trade pattern as "complementary trade flow". Moreover, a high percentage of banks and private firms are denominated their debts in Japanese Yen (Forrester, 1999). Therefore, Indonesia exports are very sensitive to the Yen-rupiah exchange rate movement. High innovation in volatility to exports in Korea always represents a possible exchange rate risk when trading with a developing country. In a nutshell, the forecast error variance decomposition for exports of Indonesia's four main trading partners are mainly the real exchange rate volatility.

Table 5.11 shows four parsimonious vector error-correction mechanisms (VECM) which can be used to examine the short-run dynamic in each country. The error correction vectors are the residuals of the cointegrating equations. Japan and the US have two VECMs, Singapore three and Korea one. The Table only indicates VECM as well as volatility terms. All the VECMs have negative signs but only the US and Japan figures show statistical significance. On the other hand, the volatility terms have negative and significant signs for all four countries. A 1% change in volatility will cause about 0.02% to 0.03% reduction in export growth in the US.; Japan, 0.03%; Singapore, 0.03%; and Korea, 0.05%. The results confirm that volatility impedes export growth is evident with Indonesia's four biggest export trading partners.

5.7 Concluding Remarks and Further Direction for Research

The paper discusses the effect of real exchange rate volatility on export trade in Indonesia. Indonesia's four biggest export-trading partners are used for analysis, namely, the US, Japan, Singapore and Korea. A standard export demand function includes the variables of real exchange rate volatility, relative export prices and foreign income. The tests show that the variables are I(1). Johansen's multivariate cointegration technique is used to test the possibility of cointegrating relationship among the variables. The results indicate that the variables are cointegrated in the long run, and more than one cointegrating vectors are exhibited. Identification becomes complicated as more than one cointegrating vectors are found. This supports the debate made by Lütkepohl and Reimers that it is difficult to give interpretation to the two cointegrating relations which may have different individual effects. Hence, it is useful to investigate the direction and the contribution of individual innovation to export fluctuation via impulse response function and forecast error variance decomposition techniques.

Both the aggregate and country-by-country levels confirm that the real exchange rate volatility exhibit negative relationship to Indonesian export trade. The volatility is probably the main reason for export uncertainty. If the hypothesis of export-led growth holds, export uncertainty will hinder economic growth and development.

In relation to real exchange rate volatility, inflation volatility may have a positive effect on real exchange rate volatility. Gonzaga and *et. al.* (1997) argues that inflation volatility explains most of the variation in RER volatility in Brazil over the last fifteen years. Hence, the theory of purchasing power parity, trade dependence and currency area are the next direction of research. Moreover, further research on how to minimize real exchange rate volatility will help to support the policy of promoting export-led growth.

Notes:

1. The aggregate export demand function is the sum of the trade-weighted export real exchange rate and such that:

$$ERER_i = \sum_{j=1}^{4} (erer_j) m_j$$

where ERER is the trade-weighted export real exchange rate. The term $erer_j$ is the bilateral export real exchange rate of Indonesia's four trading partners. m_j is the trade weight for each of the trading partner.

2. The description of data is shown as follows:

Description of Data	Source	Code
nominal exchange rate (Indonesia)	IFS	536-rf
nominal exchange rate (Japan)	IFS	158-rf
nominal exchange rate (Singapore)	IFS	576-rf
nominal exchange rate (Korea)	IFS	542-rf
export price index (Indonesia)	IFS	536-74..d
export price index (Japan)	IFS	158-76
consumer price index (Singapore)	IFS	576-64
export price index (Korea)	IFS	524-76
export price index (US)	IFS	111-74
volume of exports (Indonesia)	IFS	536-72
volume of exports (Japan)	IFS	158-72
volume of exports (Singapore)	IFS	576-72
volume of exports (Korea)	IFS	536-72
volume of exports (US)	IFS	111-72
gross domestic product (Indonesia)	IFS	536-99b
gross domestic product (Japan)	IFS	158-99b.c
gross domestic product (Singapore)	IFS	576-99b
gross domestic product (Korea)	IFS	536-99b
gross domestic product (US)	IFS	111-99b.c

3. Similar argument is echoed by Soderlind and Vredin (1996). In modeling the money demand function, they convince that finding a single cointegrating vector is sufficient to support an interpretation of that vector as a long-run money demand relation and of the associated cointegrating relation as a measure of excess money. However, an estimate of more than one cointegrating vectors makes harder to search for a money demand function, because any linear combination of the cointegrating vectors could qualify as money demand function (p.370).

4. Johansen's maximum likelihood test provides consistent estimates of long run matrix Π and short run matrix Γ_i (Eq. 5.5). With these estimates, Lütkepohl and Reimers (1992) show that the impulse responses can be used to obtain both long run and short run linkages among variables.

5. To obtain orthogonalized residuals, we have to obtain a lower triangular matrix which is derived from Eq.5.8. Let's take an example of three variables with ordering $[x, y, z]'$. Orthogonalization means that x innovation is to disturb all other variables contemporaneously within the system, whilst y innovation only contemporaneously disturb z and itself. However, z innovation does not have any contemporaneously disturb any other variables. Detailed description for the topics of impulse response and variance decomposition can refer to Enders (1995).

6. The ADF test is used since the disturbance term is likely to be serially correlated and the test can accommodate error autocorrelation by adding lagged differences in the equations (see Pesaran and Pesaran, 1997). Moreover, if order p in the ADF equation is suitably chosen, the ADF statistics have the same asymptotic distribution as the simple DF statistic under *iid* errors (see Said and Dickey, 1984).

7. Schwert (1987) uses Monte Carlo method to estimate the number of lags which is not sensitive to the strength of the moving average component. The formula is l_4=Int{4(T/100)$^{0.25}$} where T is the sample size.

8. The cointegrating regression is:

$$Ex = -\frac{\beta_2}{\beta_1} Volat - \frac{\beta_3}{\beta_1} RP + \frac{\beta_4}{\beta_1} Y *$$

where Ex, Volat, RP and Y* stand for exports, volatility, relative prices and foreign income respectively. $\beta's/\beta_1$ are the cointegrated coeffiecients.

9. Lütkepohl and Reimers (1992) highlight a potential problem. In a system of normalized cointegrated vectors, β's, it is very difficult to interpret any two relations individually in the long-run. Like volatility, a movement of real exchange rate volatility is not necessarily leading to a change of export in equal size.

10. The estimates of the long run matrix, Π is shown as:

$$\Pi = \begin{bmatrix} -0.0811 & 0.0298 & 0.0069 & 0.0391 \\ -0.1076 & 0.0076 & 0.0232 & 0.0346 \\ -0.0746 & 0.0697 & -0.0090 & 0.0524 \\ 1.2867 & 0.2958 & -0.3880 & -0.2881 \end{bmatrix}$$

Lütkepohl and Reimers (1992) argue that the above long-run matrices are not clear to interpret the exact meaning of the interactions among the variables of concern.

11. Lütkepohl (1990) indicates two propositions regarding asymptotic distributions of impulse response functions and forecast error variance decompositions of vector autoregressive models. He states that the nonstationarity of a VAR system may invalidate the asymptotic theories of distributions. In his paper, he chose to use rates of change rather than levels of the variables to estimate the model. Enders (1995) proposes that the form of the variables in the VAR should mimic the true data-generating process. It is especially important to a structural model where the form of the variables must be stationary.

12. The presence of a unit root is confirmed by the long-run persistence of a variable which exhibits some kind of I(1) behaviour.

13. I assume that the variables ΔVolat(-1), ΔVolat(-2), ΔRP(-1), ΔRP(-2) can be used as instruments for the exogeneity test.

14. A survey made by Fujita and James (1997) shows that employment created by exports of light industries increased dramatically in absolute terms, far exceeding employment created by primary exports.

Table 5.1 Augmented Dickey-Fuller Unit Root Tests

Variable	Level	First Difference
Volatility	-3.3426	-3.8835*
Relative Prices	-1.8720	-4.6790*
Foreign Income	-1.9817	-3.7732*
Exports	-2.0819	-5.8053*

Notes: (1) The ADF test examines the null hypothesis of a unit root against the stationary alternative. The optimal lag is 3 and is determined by Schwert's method (1987).
(2) To correct for small sample bias and possible effect of the lag order on the ADF test, the critical value is based on Cheung and Lai (1995). '*' indicates 5% statistical significance.

Table 5.2 Johansen Maximum Likelihood Cointegration Tests

Maximal Eigenvalue Statistics

Variable	Volatility, Relative Prices, Foreign Income, Export			
Obs.	70 (1975Q4 - 1993Q1)		Max. Lag 3	
Null	Alternative	Statistic	95% Critical Value	90% Critical Value
$r=0$	$r=1$	30.263*	28.138	25.559
$r\leq 1$	$r=2$	20.807**	22.002	19.766
$r\leq 2$	$r=3$	11.193	15.672	13.752
$r\leq 3$	$r=4$	5.112	9.243	7.525

Trace Statistics

Variable	Volatility, Relative Prices, Foreign Income, Export			
Obs.	70 (1975Q1 - 1993Q1)		Max. Lag 3	
Null	Alternative	Statistic	95% Critical Value	90% Critical Value
$r=0$	$r\geq 1$	67.375*	53.116	49.648
$r\leq 1$	$r\geq 2$	37.112*	34.910	32.003
$r\leq 2$	$r\geq 3$	16.305	19.964	17.852
$r\leq 3$	$r=4$	5.112	9.243	7.525

Notes: (1) *r* is the number of cointegrating vectors.
(2) '*' and '**' indicate significance at 5% and 10% levels respectively.
(3) The critical values are shown in Osterwald-Lenum (1990).

Table 5.3 Normalized Cointegrated Vectors (β) and Log Likelihood Test of Restrictions

Estimated Cointegrated Vectors (β)

Variable	Vector 1	Vector 2	LR Test of Restriction (H_0=0) :
Exports	-1.0000	-1.0000	
Volatility	-2.0912	-0.2245	χ^2 (2) = 11.5504* (0.003)
Relative Prices	-4.3096	0.2284	χ^2 (2) = 4.1455 (0.126)
Foreign Income	1.3423	-0.3010	χ^2 (2) = 3.6552 (0.161)

Notes: (1) Cointegrated vectors are normalized.
(2) The null hypothesis, $H_0 = 0$, shows that the coefficient of the corresponding variable in both cointegrating vectors are equal to zero; and *P*-values are in parenthesis.
(3) '*' indicates significance at 5% level.

Table 5.4 Testing Contemporaneous Correlation of Off-Diagonal Error Variance Matrix

Log-Likelihood (LL)	Value
LL (unrestricted)	$LL_u = 460.03$
LL (restricted)	$LL_R = 337.85$
$= LL_{exports} + LL_{volatility} + LL_{price} + LL_{income}$	
$LR(H_0 \mid H_1) = 2(LL_u - LL_R)$	χ^2 (4) = 164.36*

Notes: (1) The null hypothesis is that equations in the system are contemporaneously uncorrelated.
(2) The 95 and 99 percent critical values are 9.49 and 13.3 respectively *P*-values are in parenthesis.

Table 5.5 Generalized Forecast Error Variance Decomposition for Exports

Quarters Ahead	Exports	Innovations in Volatility	Relative Prices
0	1.00000	0.005374	0.089600
1	0.99794	0.004903	0.088441
2	0.99091	0.011401	0.088311
3	0.97209	0.026394	0.086537
4	0.96402	0.033851	0.085894
5	0.96401	0.034317	0.085853
6	0.96220	0.035417	0.085725
7	0.96216	0.035467	0.085720
8	0.96215	0.035496	0.085720
9	0.96211	0.035496	0.085718
10	0.96210	0.035495	0.085718
11	0.96200	0.035497	0.085717
12	0.96209	0.035501	0.085716
13	0.96209	0.035520	0.085716
14	0.96209	0.035520	0.085716
15	0.96209	0.035520	0.085716
16	0.96209	0.035520	0.085716
17	0.96209	0.035520	0.085716
18	0.96208	0.035520	0.085716
19	0.96208	0.035520	0.085716
20	0.96208	0.035520	0.085716

Table 5.6 Error Correction Model and Wu-Hausman Exogeneity Test

Dependent Variable ΔExports
69 observations (1976Q1 - 1993Q1)

Regressor	Coefficient	Standard Error	T-Ratio(Prob)
Constant	-0.0061	0.0037	-1.6571* (0.103)
ECM1(-1)	-0.0076	0.0022	-3.5001* (0.001)
ECM2(-1)	0.0828	0.0180	4.5968* (0.000)
ΔRP	0.9911	0.0344	28.8097* (0.000)
ΔRP(-1)	-0.1051	0.0314	-3.3456* (0.001)
ΔVolat	-0.0158	0.0069	-2.2889* (0.026)
ΔVolat(-1)	-0.0180	0.0068	-2.6446* (0.010)

Diagnostic Tests

$R^2 = 0.9427$
DW-statistic = 1.8583
F-statistic $F(6, 62) = 169.8776$ (0.00)*
Residual sum of squares = 0.01185
(A) Serial Correlation: $\chi^2(4) = 3.9655$ (0.411)
(B) Functional Form: $\chi^2(1) = 0.3588$ (0.549)
(C) Normality: $\chi^2(2) = 3.6421$ (0.162)
(D) Heteroscedasticity: $\chi^2(1) = 0.4479$ (0.503)
(E) ARCH: $\chi^2(1) = 0.1926$ (0.661)

Wu-Hausman Exogeneity Test

Volatility (LM statistic) $\chi^2(1) = 5.2714$* (0.022)

Notes: (A) Lagrange multiplier test of residual serial correlation
(B) Ramsey's RESET test using the square of the fitted values
(C) Based on a test of skewness and kurtosis of residuals
(D) Based on the regression of squared residuals on squared fitted values
(E) Based on Lagrange multiplier test
'*' indicates statistical significance at 5% level.

Table 5.7 Trace Statistic Tests (Country-by-Country)

US

Null	Alternative	Statistic	95% Critical Value	90% Critical Value
$r = 0$	$r \geq 1$	93.359*	53.480	49.950
$r \leq 1$	$r \geq 2$	36.751*	34.870	31.930
$r \leq 2$	$r \geq 3$	16.180	20.180	17.880
$r \leq 3$	$r = 4$	2.842	9.160	7.530

Japan

Null	Alternative	Statistic	95% Critical Value	90% Critical Value
$r = 0$	$r \geq 1$	69.900*	53.480	49.950
$r \leq 1$	$r \geq 2$	33.407*	34.870	31.930
$r \leq 2$	$r \geq 3$	14.541	20.180	17.880
$r \leq 3$	$r = 4$	4.473	9.160	7.530

Singapore

Null	Alternative	Statistic	95% Critical Value	90% Critical Value
$r = 0$	$r \geq 1$	88.115*	53.480	49.950
$r \leq 1$	$r \geq 2$	44.032*	34.870	31.930
$r \leq 2$	$r \geq 3$	19.553**	20.180	17.880
$r \leq 3$	$r = 4$	6.438	9.160	7.530

Korea

Null	Alternative	Statistic	95% Critical Value	90% Critical Value
$r = 0$	$r \geq 1$	64.718*	53.480	49.950
$r \leq 1$	$r \geq 2$	19.342	34.870	31.930
$r \leq 2$	$r \geq 3$	9.319	20.180	17.880
$r \leq 3$	$r = 4$	3.258	9.160	7.530

Notes: (1) *r* is the number of cointegrating vectors.
(2) '*' and '**' indicate significance at 5% and 10% levels respectively.
(3) The critical values are shown in Osterwald-Lenum (1990).

Table 5.8 **Normalized Cointegrated Vectors (β) and Log Likelihood Test of Restrictions (Country-by-Country)**

Country	Variable	Vector 1	Vector 2	Vector 3	LR Test of Restriction (H_0=0) :
US	Exports	-1.0000	-1.0000		
	Volatility	-0.3595	0.0373		χ^2 (2) = 31.6347* (0.000)
	Relative Prices	0.4029	0.2872		χ^2 (2) = 6.4340* (0.040)
	Foreign Income	0.0598	-0.0489		χ^2 (2) = 2.9820 (0.225)
Japan	Exports	-1.0000	-1.0000		
	Volatility	0.2042	-0.0242		χ^2 (2) = 8.7034* (0.013)
	Relative Prices	0.5993	1.1459		χ^2 (2) = 9.5229* (0.009)
	Foreign Income	0.1146	0.2862		χ^2 (2) = 8.7852* (0.012)
Singapore	Exports	-1.0000	-1.0000	-1.0000	
	Volatility	-0.2950	0.2945	-0.0652	χ^2 (2) = 23.1705* (0.000)
	Relative Prices	0.0387	0.1700	0.4070	χ^2 (2) = 2.3867 (0.496)
	Foreign Income	0.2192	0.2376	0.3226	χ^2 (2) = 13.4866* (0.004)
Korea	Exports	-1.0000			
	Volatility	-1.5293			χ^2 (2) = 17.5765* (0.000)
	Relative Prices	3.3288			χ^2 (2) = 10.1090* (0.001)
	Foreign Income	1.7822			χ^2 (2) = 15.9680* (0.000)

Notes: (1) Cointegrated vectors are normalized.
(2) The null hypothesis, $H_0 = 0$, shows that the corresponding cointegrated vectors are equal to zero; and *P*-values are in parenthesis.
(3) '*' indicates significance at 5% level.

Table 5.9 **Testing Contemporaneous Correlation of Off-Diagonal Error Variance Matrix (Country-by-Country)**

Country	LL (unresticted)	LL (restricted)	$LR(H_0 \mid H_1) = 2(LL_u - LL_R)$
US	416.3329	412.5419	χ^2 (4) = 7.5820
Japan	419.4376	412.3160	χ^2 (4) = 14.243*
Singapore	420.8557	359.4579	χ^2 (4) = 122.796*
Korea	329.3779	327.0076	χ^2 (4) = 4.7406

Notes: (1) The null hypothesis is that equations in the system are contemporaneously uncorrelated.
(2) The 95 and 99 percent critical values are 9.49 and 13.3 respectively. *P*-values are in parenthesis.

Table 5.10 **Generalized Forecast Error Variance Decomposition for Exports (Country by Country)**

US

Quarters Ahead	Innovations in: Exports	Volatility	Relative Prices
0	1.00000	0.01918	0.003871
5	0.86838	0.16684	0.023085
10	0.86782	0.16712	0.023320
15	0.86780	0.16714	0.023327
20	0.86780	0.16714	0.023327

Japan

Quarters Ahead	Innovations in: Exports	Volatility	Relative Prices
0	1.00000	0.02798	0.084713
5	0.92607	0.66266	0.070499
10	0.92501	0.65797	0.069407
15	0.92502	0.65767	0.069327
20	0.92502	0.65766	0.069322

Singapore

Quarters Ahead	Innovations in: Exports	Volatility	Relative Prices
0	1.00000	0.003189	0.082442
5	0.85482	0.088364	0.074606
10	0.84626	0.088417	0.073667
15	0.84553	0.088406	0.073593
20	0.84544	0.088401	0.073583

Korea

Quarters Ahead	Innovations in: Exports	Volatility	Relative Prices
0	1.00000	0.06806	0.001400
5	0.83248	0.22557	0.048120
10	0.83036	0.22759	0.048775
15	0.83033	0.22761	0.048790
20	0.83033	0.22762	0.048790

Table 5.11 Error Correction Vectors and Degree of Volatility

Country	Error-Correction Vector	Volatility
US	- 0.0564 ECM1(-1)	- 0.0260 Volat(-1)
	(-0.5792)	(-3.4119)*
	- 0.1790 ECM2(-1)	+ 0.0242 Volat(-2)
	(-1.7556)**	(3.2009)*
Japan	- 0.0775 ECM1(-1)	- 0.0330 ΔVolat(-1)
	(-2.9560)*	(-3.0943)*
	+ 0.1023 ECM2(-1)	
	(2.3484)*	
Singapore	- 0.02666 ECM1(-1)	- 0.0272 ΔVolat
	(-1.0163)	(2.1570)*
	- 0.00628 ECM2(-1)	0.0362 ΔVolat(-2)
	(-0.0201)	(2.8507)*
	- 0.00863 ECM3(-1)	
	(-0.2518)	
Korea	- 0.0055 ECM1(-1)	- 0.0512 ΔVolat
	(-0.4844)	(-2.7626)*

'*' and '**' indicate 5% and 10% significant levels respectively. T-ratios are in parenthesis.

Fig. 5.1 Generalised Impulse Responses of Exports to One SE Shock in Volatility

Fig. 5.2 Generalised Impulse Responses of Exports to One SE Shock in Rel. Prices

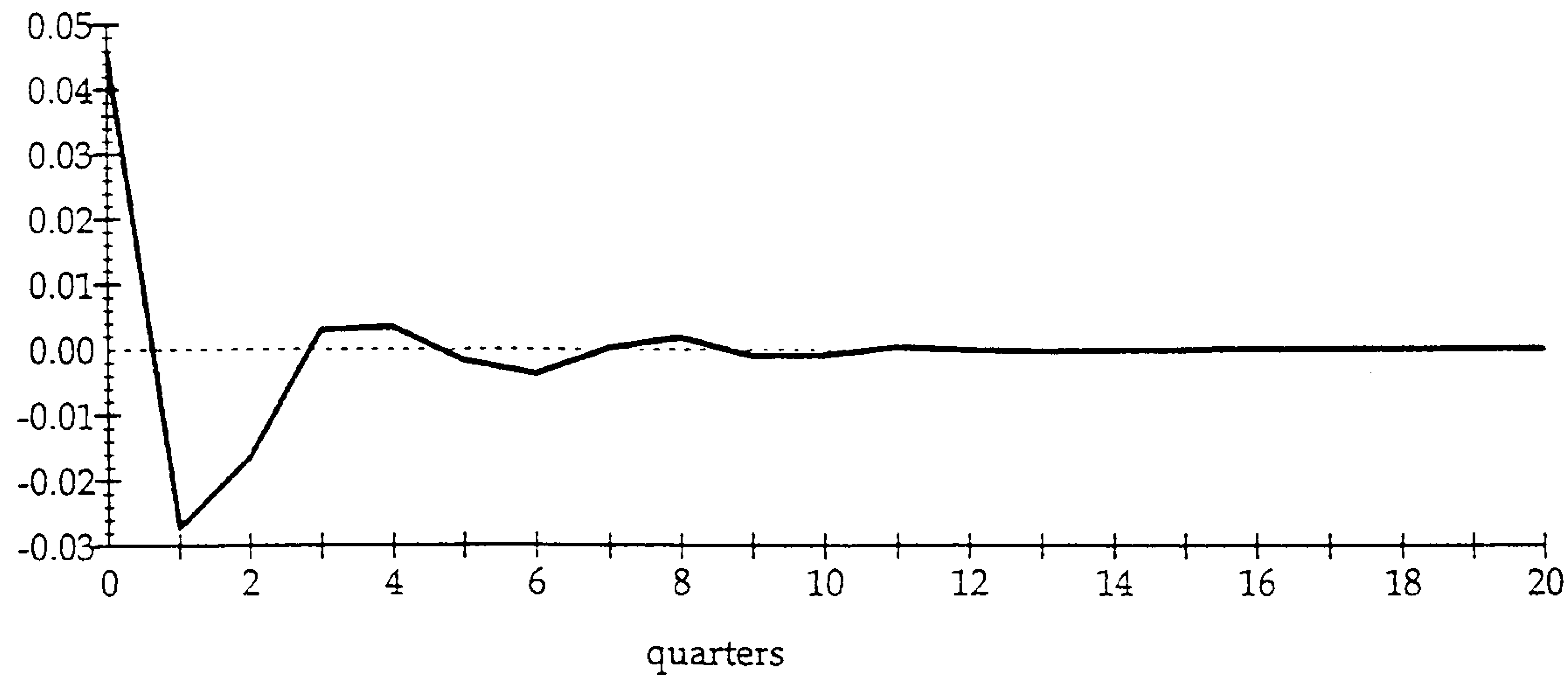


Fig. 5.3 Generalised Impulse Responses to One SE Shock in Foreign Income

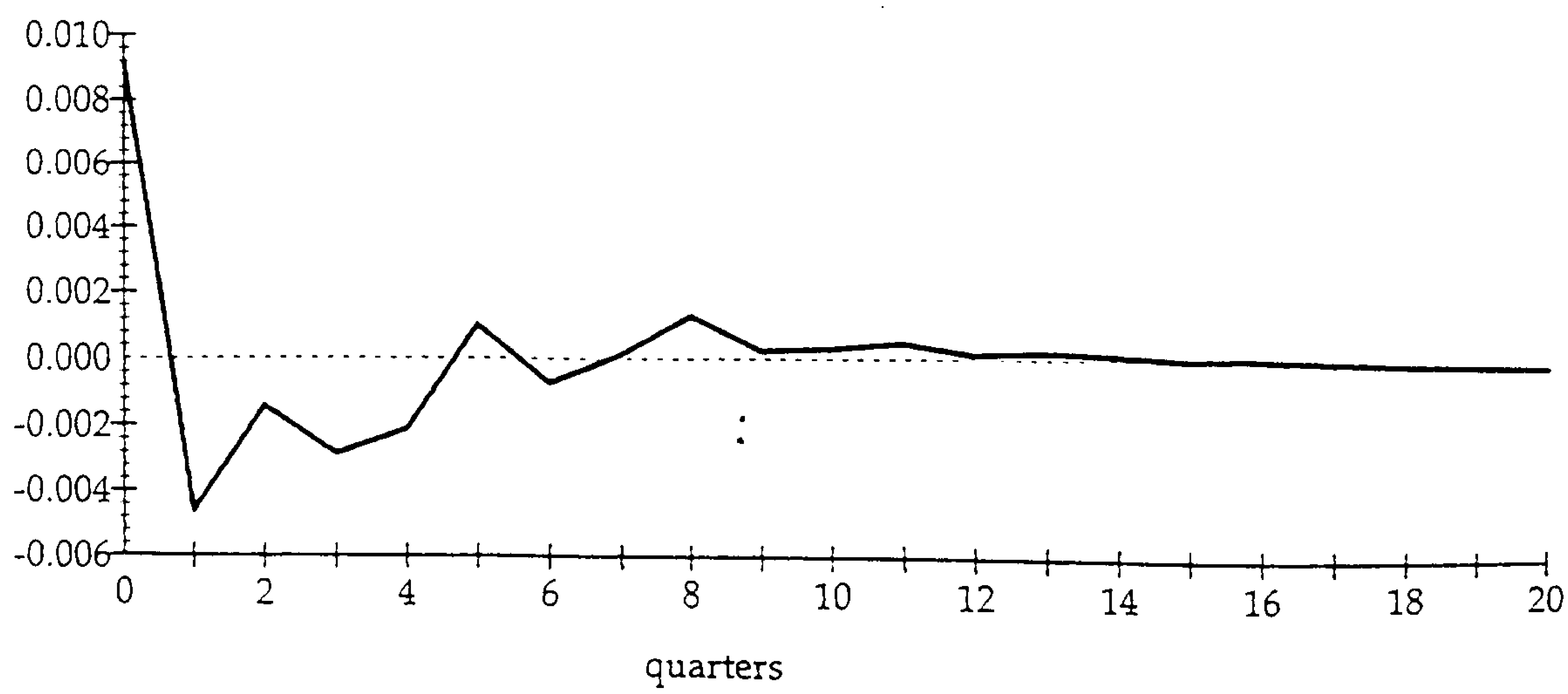


Fig. 5.4 Generalised Impulse Responses of Exports to One SE Shock in Volatility

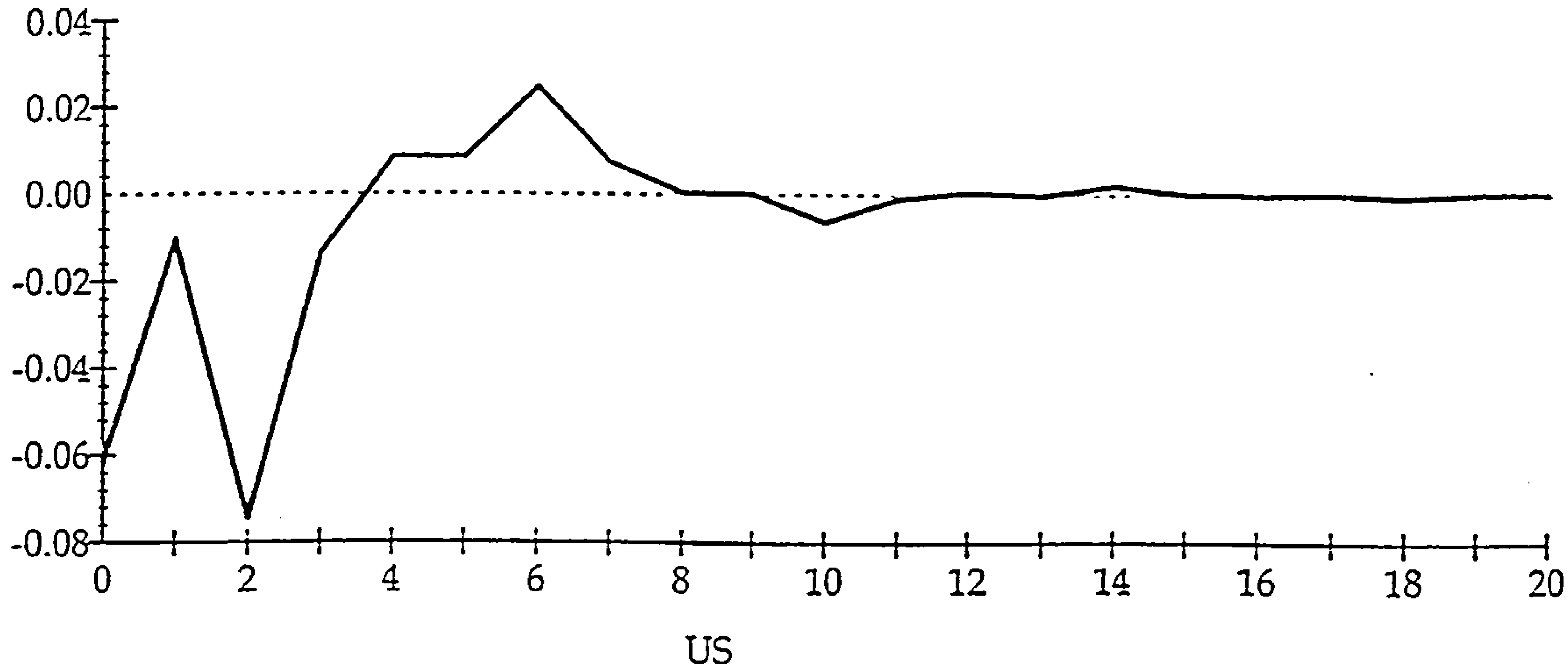


Fig. 5.5 Generalised Impulse Responses of Exports to One SE Shock in Volatility

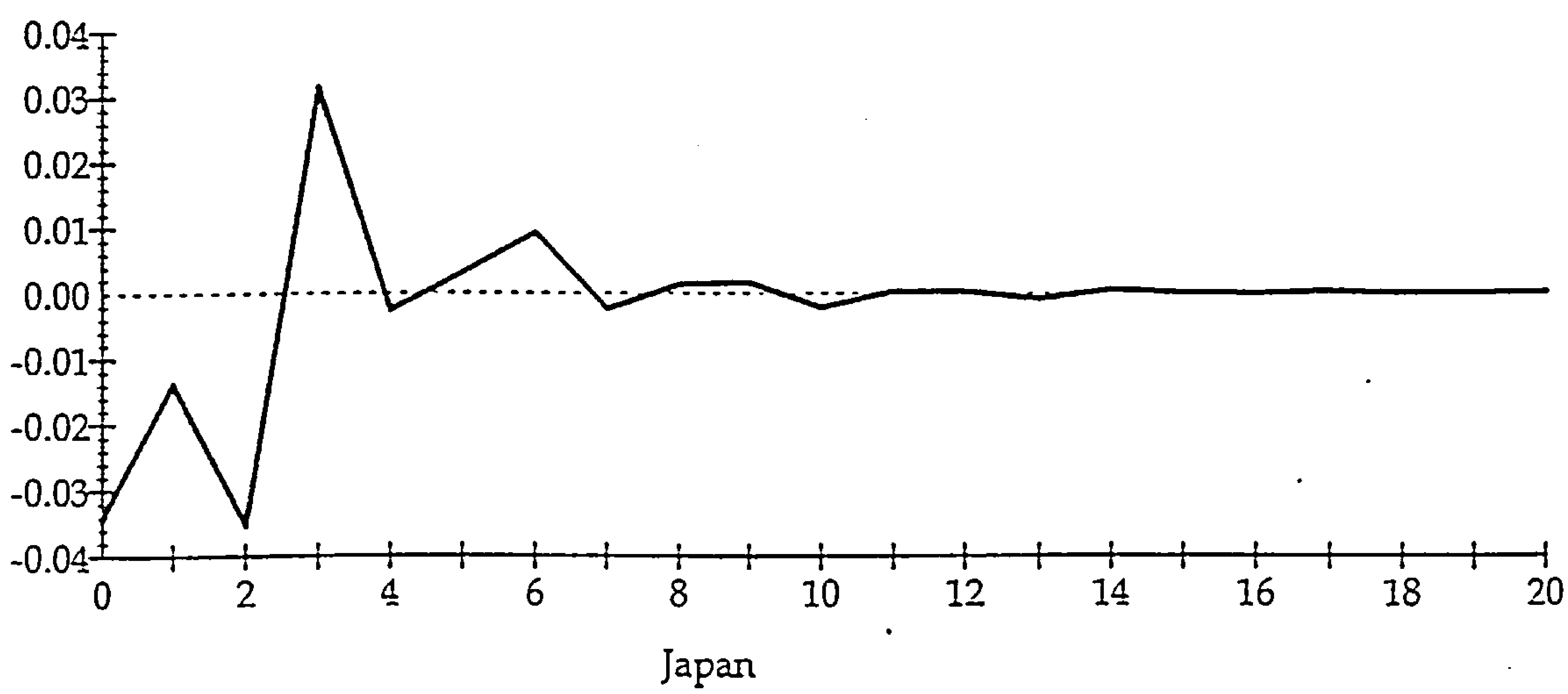


Fig. 5.6 Generalised Impulse Responses of Exports to One SE Shock in Volatility

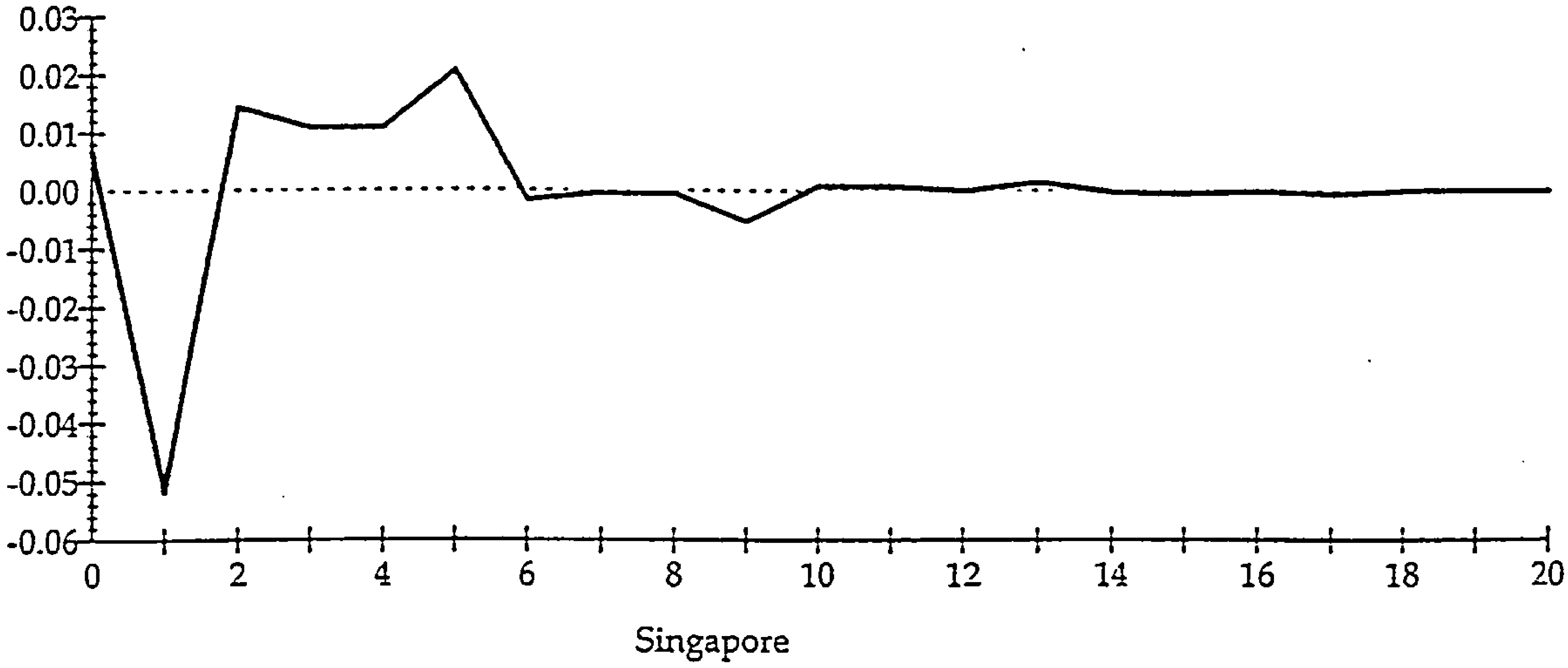
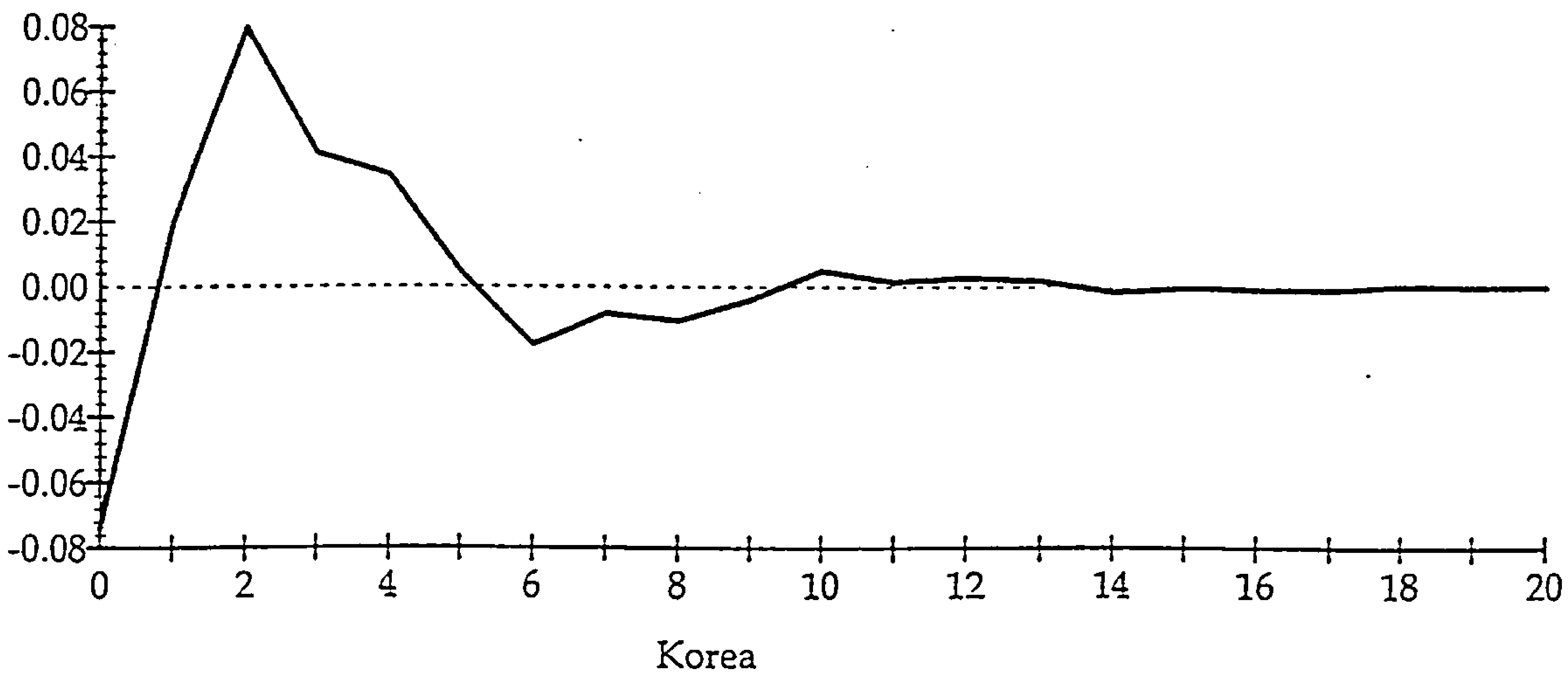


Fig. 5.7 Generalised Impulse Responses of Exports to One SE Shock in Volatility



Chapter 6 Empirical Studies on Trade Weighted Exchange Rates

6.1 Introduction

The breakdown of Bretton Woods system in the 1970s has shifted the international monetary system into a new era of floating exchange regime. The empirical regularities of nominal exchange rates movement are well described as the random walk model (Abuaf and Jorion, 1990; Hakkio, 1986; Huizinga, 1987; Whitt, 1989). Exchange rate stability is crucial to a country's economic growth and trade. Substantial variability of domestic exchange rate can generate unfavourable consequences and such fluctuation may affect the terms of trade, reduce international competitiveness and cause larger variation of inflation rate. Unforeseeable fluctuation also diminishes the volume of international trade (Manzur, 1993). The effects may ricochet to the real economy that restrains regular operation of the financial system (Engel and Hakkio, 1993). The unpredictability of nominal exchange rate changes and its pass-through on domestic prices are characterized in the flexible exchange rate regime. The transmission of international inflation to a domestic country can cause domestic exchange rate volatility and variations of macroeconomic fundamentals. The linkage of exchange rate instability and domestic inflation variability is well documented in the theory of Purchasing Power Parity (PPP).

6.1.1 Recent Literature Review

Recent literature has drawn arguments over the validity of PPP. Research shows that the evidence of PPP is supported by substantial money shocks and high variability of inflation rates between the foreign and the domestic countries; and thus the monetary shocks usually dominate the effects of real shocks, McNown and Wallace (1989), Phylaktis (1990, 1992). Researchers have recently employed integration and cointegration techniques to test the validity of PPP. The techniques can help test the non-stationarity of exchange rates and prices. The cointegration method also identifies the long run relationship of variables whereas traditional OLS technique cannot. Nevertheless, the statistical support of PPP is mixed and inconclusive. The deviation may be due to simultaneous bias, the choice of price index, the length of lags, the composition of bilateral or multilateral approach, the inclusion of transaction costs and the length of the sample period.

Table 6.1 is a list of the studies on the validity of PPP, which have used integration and cointegration techniques. Most of the studies use CPI or WPI for price indices. Bilateral exchange rates are mainly employed except in Layton and Stark (1990) and Bahmani-Oskooee (1993a), where the effective exchange rates are used. The support for PPP is, however, inconclusive and mixed.

In his paper, Taylor (1988) allows for measurement errors and transportation costs in testing PPP, nevertheless, he still finds no support of PPP in five major exchange rates. Patel (1990) does not support a long run PPP by applying Dickey-Fuller and Stock-Watson tests, which gives an explanation for non-stationary behaviour of real exchange rates. Johnson (1991) argues that it is not the construction of aggregate price indexes leading to the rejection of PPP; it is rather the non-stationary of real exchange rate and the permanent changes of relative prices that cause the failure of PPP. Kim and Enders (1991) finds that shocks to the real exchange rates are not self-correcting and this implies no support for PPP. Using international commodity data, Fraser & *et. al.* (1991) shows unfavourable to PPP hypothesis between exchange rates and disaggregrated prices. Lim (1992) uses real exchange rate data between the U.S. and other G-10 countries. He finds that the results are not supportive to PPP hypothesis. However, there is some evidence for the role of fundamental factors in determining the real exchange rate behaviour. Those factors include productivity, real domestic and foreign interest rates and the terms of trade. Bahmani-Oskooee (1993a) constructs the effective exchange rates, however, little empirical support is found among twenty-five less developing countries. Flynn and Boucher (1993) use Perron test and allow for structural break in the sample period to test the real exchange rates and they find no support for the long run PPP.

On the other hand, Edison and Klovland (1987) expand the simple PPP model by including structural factors, such as the effect of differential sectoral productivity growth on the relative non-traded goods. They conclude that "proportionality between the exchange rate and relative price levels emerges only in the long run, after having taken into account the effects of changes in real, structural factors like the relative levels of productivity and the terms of trade." Enders (1989) examines the real exchange rate movement of Britain and the U.S. using the pre- First World War data. The statistical results of ARIMA and cointegration tests support the claim of PPP during the greenback and gold standard periods. McNown and Wallace (1989) test four high inflation countries and show some evidence in support of PPP. It is more likely to validate PPP doctrine for those countries with high inflation rates so that monetary expansion will taper off real factors. Whitt (1989) uses Sims test and random walk hypothesis and finds that real exchange rate does not follow a random walk and therefore a long run equilibrium level will be expected. Abuaf and Jorion (1990) argue that the inability to reject random walk hypothesis is due to the poor power of the tests employed rather than the evidence against PPP. Having used the Monte-Carlo experiments, the long run PPP is found. Phylaktis (1992) uses the Greek data of 1920s, she finds strong supportive evidence for long run PPP. Moreover, the high inflation rate in Greece also supports the view that PPP is likely to hold with large price differentials between country pairs. Phylaktis and Kassimatis (1994) find the presence of one common stochastic trend among eight Pacific Basin countries that is consistent to long run movement of PPP. By avoiding *a priori* restrictions on the cointegrating vectors, Pippenger (1993) uses trivariate cointegration tests and finds long run PPP supportive. Moosa (1994) tests PPP in terms of proportionality, symmetry and exclusiveness, the results are overwhelmingly in favour of PPP.

In the other articles, the empirical results for PPP are mixed. Davutyan and Pippenger (1990) show that the acceptance or rejection of PPP depends on the size of transaction costs and measurement errors. Thus, the spread of transaction costs may lead to regression switching. They conclude that if the effects of transaction costs are eminent, research on PPP is biased and inconsistent. McNown and Wallace (1990) find that the evidence for PPP is marginal. The support may depend on the use of price index, exchange rate regimes and structural changes. Ardeni and Lubian (1991) also find that the choice of data frequency can affect the support for PPP. Using thirty years' monthly data, they cannot find support for PPP. Conversely, a long run PPP is found when annual data is used. Cheung and Lai (1993a) show that the evidence of PPP also depends on the statistical power of cointegration tests and *a priori* restriction on equations. They conclude that the statistical power advantage of the Johansen test is superior to the standard residual-based tests. Moreover, they claim that the restricted models "ignore any interactions in the determination of prices and exchange rates that allowed for in the unrestricted trivariate model" (p.189). Conejo and Shields (1993) test relative PPP version for five Latin American countries. They find that only more diversified economies like Brazil and Mexico can the long run PPP be found. Kugler and Lenz (1993) use multivariate cointegration methodology for testing Deutsche Mark against fifteen countries and only six European countries are found to be supportive to PPP. Lippert and Breuer (1994) expand the version of PPP by including changes in fundamental, supply and demand factors. The real exchange rates show statistically significant, reflecting that changes in permanent factors to real exchange rate may be a contributing source to the behaviour of nominal exchange rate (p.1035). Mahdavi and Zhou (1994) find that the validity of PPP actually depends on the property of the data and the level of inflation rates.

6.1.2 Contents in Brief

This chapter provides an empirical study on the movement of exchange rate and prices in Indonesia. An effective exchange rate (1978 - 1993) will be constructed to capture the effects of trade weights to Indonesia's different trading partners. Since Indonesia has experienced two devaluations in the eighties, it is important to follow the effects of exchange rates on relative prices. Testing the validity of PPP becomes the cornerstone of the study. We first apply integration and cointegration technique to test PPP. Since most of the macroeconomic time series are non-stationary, the role of cointegration method provides a new and more appropriate statistical method in estimating the series. The advantage of cointegration technique is that if two series are cointegrated, Engle and Granger's General Representation Theorem states that there exists an error correction term (ECM) in the equation. The coefficient of ECM traces out short run deviation from the long run relationship. Moreover, testing the validity of PPP depends on the restriction on the coefficients of the vectors. This implies an examination on the symmetry and proportionality of the equations. Traditional views state that rejection of the null hypothesis of symmetry and proportionality signifies the invalidity of PPP. In addition to test for PPP, it is also necessary to provide evidence of symmetry and proportionality properties in the empirical studies.

Another study on the validity of PPP is to give room on the issue of structural break. It is generally known that economic aggregates have the properties of difference-stationary and trend-stationary processes. Perron (1989) argues that fluctuations of most macroeconomic time series are indeed transitory. By allowing one time single change in the intercept and/or the slope the series would be stationary around the deterministic trends. It means that the break acts as a buffer by removing the influence of the shocks from the noise function. As Indonesia experienced two devaluations in the eighties, applying Perron's structural breaks on the devaluation periods will show whether fluctuations of the series are indeed stationary around the deterministic trend function.

If the random walk process dominates the exchange rate series, it is necessary to examine the size of random walk and its persistence in the nominal and real effective exchange rates. If a series is mainly driven by a random walk component, deviation from the long run is permanent, whilst temporary shock will eventually move to mean-reverting. Therefore, we apply Cochrane's variance ratio to test the exchange rate persistence. Understanding the effects of any shock is crucial to line up appropriate exchange rate policy in a small open economy like Indonesia.

The chapter is thus divided into the following sections. Section 1 gives an introduction and recent literature survey on PPP. Section 2 provides three PPP approaches in modelling exchange rate behaviour. Section 3 introduces the Indonesian economy as well as the choice of exchange rate policies pursued by the government. This section also emphasises the linkages between exchange rates and prices. Variable construction is in Section 4. Section 5 shows the empirical studies for PPP. Section 6 tests symmetry and proportionality assumptions. The issue of structural break on the sample data is in Section 7. Section 8 presents the persistence and the size of the random walk to both nominal and real effective rates. Concluding remarks are in the last section.

6.2 Modelling the Exchange Rate Behaviour

6.2.1 The Neutral Money Approach of PPP

Junge (1984) refers Cassel's (1919, 1922) interpretation of PPP is essentially a monetary theory. He states that PPP equilibrium includes internal and external value of a currency. The internal value of the money is determined by the purchasing power (i.e. the amount of goods of one domestic currency can buy) of its home country whilst the external value of money is measured by the domestic purchasing power relative to the foreign purchasing power. In other words, it is estimated by the bilateral exchange rate. The absolute form of PPP is:

$$S_t = P_t / P_t^*$$

(6.1)

where S_t is the value of domestic currencies per foreign currency. P_t and P_t^* are the general price indices of domestic and foreign countries respectively. The general prices are the weighted sum of the same goods across countries. The level of utility or welfare of the consumers therefore depends on the purchasing power of the countries. Another form of PPP is written as the relative version:

$$\dot{S} = \dot{P}_t / \dot{P}_t^*$$

(6.2)

where (•) represents the change of a variable. P_t is $(dP_t/dt)/P_t$; P_t^* is $(dP_t^*/dt)/P_t^*$ and $S_t^* = (dS_t/dt)\ P_t$ representing domestic inflation rate, foreign inflation rate and the change of the exchange rate respectively. In other words, the exchange rate changes depend on the inflation differential across countries, i.e.

$$\frac{(S_{t+1} - S_t)}{S_t} = \frac{\pi_t - \pi_t^*}{1 + \pi_t^*}$$

(6.3)

where π_t is the inflation rate.

If the foreign inflation rate is small in the denominator, Eq. 6.3 can be expressed as:

$$\frac{(S_{t+1} - S_t)}{S_t} = \pi_t - \pi_t^*$$

(6.4)

That is, exchange rate changes are determined by the inflation differential across countries. The level of relative prices change directly affects the determination of exchange rate. The exchange rate may be diverted from short run PPP due to time movement of price changes. However, relative prices will dictate the time path movement of the exchange rate that restores to long run PPP. Junge (1984) argues that PPP arises as an implication of the neutrality of money in the economies, given constant relative prices. "With the price level of each country determined by its stock of money and relative prices determined by tastes and technology, the equilibrium price levels and the equilibrium exchange rate will always change in proportion to the exogenous stock of money. In such a monetary framework there is no causal link between the price level ratio and the exchange rate. Instead, the price level and exchange rate are endogenous variables and *ceteris paribus* jointly influenced by the stock of money. PPP arises as an association between endogenous variables." (p.45). Endogeneity creates a problem of simultaneity bias which makes the empirical results inaccurate (Krugman, 1978; Giovannetti,1992). Moreover, the assumption of money neutrality implies that money is neutral and exchange rate is not affected by any purely monetary disturbances. However, Baillie and McMahon (1989) disagree with money neutrality version. They assert that monetary disturbances usually cause short run deviations between the exchange rate and relative prices because of differences in the speed of adjustment, especially goods markets are in particular mainly affected by institutional rigidities and imperfect information dissemination (p.67).

6.2.2 The Law of One Price and the Arbitrage Approach of PPP

One of the justifications of PPP is the classical supposition of the Law of One Price. The Law states that the domestic price of a commodity equals to foreign price times the adjusted exchange rate, assuming the commodities are identical. Eq. 6.5 and Eq. 6.6 show the absolute and relative versions of arbitrage approach respectively:

$$P_t = S_t \bullet P_t^* \tag{6.5}$$

and

$$\dot{P}_t = \dot{S}_t \bullet \dot{P}_t^* \tag{6.6}$$

The arbitrage approach assumes that prices move to the same direction and are equal across countries due to international competition and commodity arbitrage. This relationship requires external factors such as perfect information availability, perfect competition environment, non-existence of trade barrier and transaction costs. Perfect competition provides one single world market and the international traded commodities will be adjusted and arbitraged at more or less the same speed which causes no international trade discrepancies (Junge, p.21-23). Giovannetti (1992) claims that the validity of PPP is questionable once the law of one price is rejected. On the other hand, even if the law of one price holds, differences in price indices and weighting will also cause the failure of PPP (p.90). The constraints of the law of one price are doomed to failure because of the following reasons:

1) Trade barriers according to tariff and quotas (Davutyan and Pippenger, 1990; Taylor, 1988).
2) Inclusion of traded and non-traded goods and the famous productivity growth bias (Balassa 1964; Samuelson, 1965).
3) Differences in price index and weighting (Isard, 1977; Milone, 1986).
4) Sticky prices in the goods market (Dornbusch, 1976a, 1976b).
5) Different consumption preferences across countries (Engle, 1992).

6.2.3 The Efficient Market Approach of PPP

The efficient market approach of PPP is best regarded as the asset market theory of exchange rate determination. Similar to stock prices, bond prices and commodities traded prices, exchange rates are also treated as asset prices. Manzur (1993) argues that "expectations about the future earnings of a company determine its current share price, so too for exchange rates: the current rate reflects expectations of the market about the future course of economic policy as well as other fundamentals such as competitiveness, productivity and the terms of trade" (p.15). Therefore, expectation forms an important ingredient in analysing the efficient market approach of PPP. The best well-known quotation for the definitions of efficiency is derived from Fama's (1965) paper. He defines an efficiency market as embodying a "large number of rational, profit maximisers actively competing with each other to predict future market values of individual securities and where important current information is almost freely available to all participants." Therefore the hypothesis of an efficient foreign exchange market is "in principle merely the theory of informational efficient financial markets extended to the international money market arena" (Baillie and McMahon, 1989). Statistically speaking, the efficient market approach of PPP is expressed as:

$$E[Z_{t+n}] = E[S_{t+n}] - E[P_{t+n} - P^{*}_{t+n}] = 0 \tag{6.7}$$

and

$$E[Z_{t+1} | \Omega_t] \tag{6.8}$$

where E(•) is the expectation operator and Z is the expected return or the forecasting error from the law of one price. Eq. 6.8 shows that the expected return of exchange rate is uncorrelated with any element of the information set, Ω, at time *t*, which contains all relevant information required for the price formation. Eq. 6.7 therefore states that an efficient market ensuring the exchange rate at time *t* is independently determined. Change in exchange rate is uncorrelated and an efficient market price follows a random walk (Fama, 1970). An extrapolation of past price changes of S_t does not lead to any *ex ante* profit opportunities. Hence $E[Z_{t+n}]$ is zero and deviations from the law of one price is also to be zero. Traders will adjust price changes at time *t* until the price differential equals to the expected exchange rate. The efficient market approach of PPP provides a lot of empirical opportunities; however, the assumptions of this approach are challenged, e.g. the assumption of risk neutrality, no transaction and information costs (Baillie and McMahon, 1989), and the problem of free-rider (Grossman and Stiglitz, 1980).

6.3 Exchange Rate and Price in Indonesia

6.3.1 The Background

Indonesia is an oil exporting country. The sudden windfall from oil revenue in the seventies was absorbed into the domestic economy. The inflows of foreign exchange increased private and government spending. The expenditure put pressure on the price of traded (non-oil) goods to the prices of non-traded goods. The increase demand for non-tradables raised the general price level and more resources would be allocated for producing non-tradable goods. The decline in production of the traded sector, mainly the manufacturing sector, is referred as "Dutch Disease" phenomenon (Neary, 1985; Pangestu, 1990). An increase in general price index basically affects the movement of exchange rate. Sabirin (1993), the managing director of the Bank Indonesia, says that "exchange rate movements would affect the allocation of expenditures on domestic vis-à-vis imported goods and services, and the preference towards holding domestic vis-à-vis foreign financial assets, the movements would ultimately affect aggregate output, external balance, as well as inflation rate" (p.207). Hence a stable exchange rate will be an ideal to achieve internal and external balances, preventing large scale of speculative acquisition for foreign currencies vis-à-vis domestic currency.

Indonesia basically adopted a fixed exchange rate system since 1971. However, it was switched to the managed floating exchange regime in 1978. During the fixed exchange rate period, Indonesian Rupiah was pegged to US dollar at a rate of Rp415 per US dollar. This situation lasted until 1978, when the currency was devaluated by 50% against per US dollar. Devaluation took place because the oil boom made Rupiah overvalued which reduced international competitiveness and increased the prices of non-tradables relative to the prices of tradables. One of the reasons for devaluation was to curb down high inflation rate that was generated from the oil boom. The managed floating became a popular option to put the rate within the target level. The intervention rates were set everyday and the Central Bank would buy and sell foreign currency at that rate (Sabirin, 1993, p.214). During the eighties, two devaluations were pursued in 1983 and 1986 respectively. A series of financial and trade reforms followed the devaluations. The objectives were to increase export competitiveness and to sustain economic growth. If devaluations in the seventies aimed at exchange rate protection, devaluations in the eighties could be the reaction to oil price decline and the policies were accompanied by consequent financial liberalization and deregulations (Warr, 1984).

In regard to price changes, some argue that the price changes in Indonesia are due to excess government spending over revenue. The inflow of foreign earnings from oil price production has caused excess domestic demand for tradable and non-tradable goods. Aghevli and Khan (1977) construct a feedback model of inflation for Indonesia. They argue that the initial price increase was aggravated by the rise of government expenditure in the late fifties and by the drought in 1961 on food prices. Increasing in the nominal government expenditure had forced the authorities to finance the expenditure by the issuance of money. A rise in money supply triggered a spiralling effect on inflation rate. According to the monetarist model, both exchange rates and prices were determined simultaneously. Any depreciation of currency will concurrently cause relative higher inflation. Dornbusch and Fischer (1993) also argue that rising export price, oil boom and accommodating monetary policies are the main reasons for high inflation rate in the seventies. The effect of devaluation on inflation also serves for another concrete argument. Fischer (1989) says that the role of the exchange rate in inflation is controversial and critical. It is because "devaluation increases the prices of traded goods and is itself inflationary. Increases in the inflation rate are often precipitated by large devaluations" (p.122). Masih (1987) develops an econometric analysis of the structuralist-monetarist explanations of inflation in five developing Asian countries. He finds that "currency depreciation in Korea, the Philippines and Indonesia appears to have significant effect on the inflation rates" (p.236).

Since the exchange rate changes may link with general price changes (the causal relationship depends on the exchange rate regime), it is possible to model the exchange rate and prices in the form of PPP. Figures 6.1 and 6.2 show the changes of nominal effective exchange rate with domestic price (IP) and effective foreign price respectively. (The construction of exchange rate and prices will be discussed in the next section). Both figures indicate that fluctuation of nominal effective exchange rate is more volatile than the two prices. Those three spikes actually represent the actual devaluations occurred in 1978, 1983 and 1986 respectively. By comparing the changes of the two prices, Figure 6.3 shows that the volatility of domestic price is higher than the effective foreign prices. The movement of exchange rate may give an account of the volatile domestic price. Lastly, Figure 6.4 indicates the ratio of domestic price to effective foreign price. The upward trend of the ratio confirms higher inflation in the domestic economy. In order to keep the real effective exchange rate stable, the percentage rise in domestic price should be offset by the same percentage depreciation of the nominal effective exchange rate.

6.4 Construction of Exchange Rates and Prices

6.4.1 Introduction

This section tries to construct the exchange rates and prices in Indonesia. Most papers use bilateral exchange rates and price indices/ GDP deflator to illustrate the relationship. Using bilateral rate may not genuinely reflect the true rate since exchange rate fluctuation is not only influenced by one foreign country. Bilateral rates give an inaccurate position in comparing international purchasing power of a currency. In a small open economy like Indonesia, export diversification causes multilateral trades with different foreign trading partners. Aizenman (1984) argues that "the doctrine of PPP should also hold better between neighbouring countries, and between countries with larger potential trade, because of the power transaction cost of trade in goods between such countries." Phylaktis and Kassimatis (1994) also argue that the support of PPP may relate to the degree of "openness" to the trading partners. They show that the degree of openness in the Pacific Basin is larger than their counterparts in the west. In a substantial open economy, "the role of traded goods is also substantial in national price indices leading to smaller measured deviations from PPP" (p.492). Hence, it is more reliable to construct a basket of currencies or an effective exchange rate index to reveal the true price of the domestic currency against its major trading partners.

Another issue is to choose a suitable price index. As noted by Officer (1978), it is good to use GDP deflator. However, the deflator adheres to a current-weighted index rather than to a base-weighted index. Assessing GDP deflator is difficult because of data limitation and unavailability. Some researchers prefer to use WPI. The use of WPI is criticized by Officer (1980) because the index is heavily weighted with tradable goods and hence it is usual to support PPP. In this chapter, we use CPI for constructing the index as it covers both non-tradable and tradable goods. "(CPI) has the advantage of a base-weighted index expressly designed to measure changes in the price level of an average basket commodities consumed by members of an economy" (Layton and Stark, 1990). Consequently, we use CPI to construct effective exchange rates and prices.

6.4.2 Variables Construction

The IMF has developed the multilateral exchange rate model (MERM) for the major developed countries. Researcher like Rana (1981) also constructed effective exchange rate for the ASEAN countries. To the author's best knowledge, effective exchange rates and prices are not available for Indonesia. Hence, indices of the effective rates and prices must be constructed for purchasing power comparison. The choice of weighting is one of the prime criteria in constructing the effective rates.

There are two methods to make the indices, namely, the arithmetic averaging and the geometric averaging. The nominal effective exchange rate using arithmetic averaging (NAW) is defined as follows:

$$NAW = \log\left\{ \sum_{i=1}^{n} w_i \left(\frac{R/\$}{F_i/\$} \right) \right\} \tag{6.9}$$

the nominal effective exchange rate using geometric averaging (NGW) is as:

$$NGW = \sum_{i=1}^{n} w_i \log \left(\frac{R/\$}{F_i/\$} \right) \tag{6.10}$$

R/\$ is the price of Indonesian currency (Rupiahs) per US dollar; whilst F_i/\$ is the price of foreign currency of *ith* country per US dollar. ((R/\$)/(F_i/\$)) indicates the price of Rupiahs per foreign currency of the *ith* country. w_i is the share of the value of *ith* exporting country to the total exports values. The summation of w_i is 1[1]. The differences of Eqs. 6.9 and 6.10 are the means of averaging.[2] The rule of thumb is to choose a country that its share of total exports is one or greater than one percent. Throughout the whole sample periods, US and Japan are the most important exporting countries to Indonesia; and Singapore also shares an significant part in the South East Asia region. The bilateral exchange rates are originally extracted from the *CD-Rom* version of the IMF's *International Financial Statistics* (line AE), 1994. The weights are derived from the *Direction of Trade Statistics,* various issues. Since the trade figures are only available from 1978, the whole sample size is chosen from 1978 to 1993, quarterly data. In constructing the prices, effective arithmetic price (PRA) and effective geometric price (PRG) are made which represent the weighted averaging foreign prices. The construction of PRA and PRG are in Eq. 6.11 and Eq. 6.12 respectively:

$$PRA = \log \left\{ \sum_{i=1}^{n} w_i \left(P_i \right) \right\} \tag{6.11}$$

and

$$PRG = \sum_{i=1}^{n} w_i \log \left(P_i \right) \tag{6.12}$$

P_i is the consumer price index for the *ith* country. The weighting share is unchanged and each weight corresponds to the relevant country share. Indonesia's consumer price (IP) represents the domestic price. CPI is obtained from *CD-Rom, International Financial Statistics* (line 64) except China. The price index (Retail Price Index, RPI) of China is obtained from the State Information Centre of China. For the purpose of comparing the real effective exchange rates, the ratio of effective foreign price to domestic price (P_i/IP) is multiplied to Eq. 6.9 and Eq. 6.10:

$$REA = \log \left\{ \sum_{i=1}^{n} w_i \left(\frac{R/\$}{F_i/\$} \cdot \frac{P_i}{IP} \right) \right\} \tag{6.13}$$

REA is the real effective exchange rate using arithmetic averaging. The real effective exchange rate using geometric averaging (REG) is as:

$$REG = \sum_{i=1}^{n} w_i \log \left(\frac{R/\$}{F_i/\$} \cdot \frac{P_i}{IP} \right) \tag{6.14}$$

Another way to estimate the real exchange rate is to follow Bahmani-Oskooee's (1993a; 1993b) method. He first constructs two prices called exchange rate adjusted effective foreign prices based on arithmetic (PAW) and geometric averaging (PGW). These two indices are then regressed against domestic price (IP)[3] and therefore:

$$\log IP = \beta_0 + \beta_1 \log PAW \qquad (6.15)$$

where PAW is:

$$\log PAW = \log\left\{\sum_{i=1}^{n} w_i \left(\frac{R}{F_i} \bullet P_i\right)\right\} \qquad (6.16)$$

and

$$\log IP = \delta_0 + \delta_1 \log PGW \qquad (6.17)$$

where

$$\log PGW = \sum_{i=1}^{n} w_i \log\left\{\left(\frac{R}{F_i}\right) \bullet P_i\right\} \qquad (6.18)$$

where R/F_i is the price of Rupiah per foreign currency of *ith* country.

6.5 Integration and Cointegration

6.5.1 Introduction

The wisdom of integration technique has been widely used since most of the macroeconomic time series are known to be non-stationary. Critical analysis of integration and cointegration are discussed in the papers of Granger (1991), Engle and Granger (1991), Perman (1991), Muscatelli and Hurn (1992), Banerjee & *at.al.* (1993), McCallum (1993), and the alike. The role of cointegration technique provides a new and more appropriate statistical method in estimating macroeconomic time series. Classical statistical inference are invalid and mis-specified the models in the sense that economic time series are treated as stationary. The solution to achieving stationarity through differencing not only reduces the degree of freedom, but also loses long run information of the variables. Cointegration concept allows one to specify the model in *levels* of the variables. The model therefore, incorporates the long run parameter as well as the error correction term (ECM) which captures the speed of adjustment from a shock. In dealing with non-stationary series, some researchers are likely to difference the series. Phillips (1987) and Fuller (1976) criticise the differencing method that may cause bias in the testing procedure. Dickey and Fuller (1979) also states that differencing procedure can reduce the power in rejecting the random walk model.

Economic theories always emphasise the importance of equilibrium relationship of the series. The technique of cointegration shows that equilibrium relationship is established once the series are cointegrated with the same order. The technique can apply to a single equation of the series or to a system of the equations. Moreover, the existence of cointegration provides statistical groundwork for ECM modelling. The ECM model is so popularized because it provides a way for separating the long run relationship of the economic variables from their short run dynamics. Likewise, another interesting aspect of the cointegration is called the superconsistency property of least squares estimates of the cointegrating vectors (Muscatelli and Hurn, 1992). An OLS regression of any two series will yield a consistent estimate if the variables are cointegrated; and the rate of convergence for an OLS estimates to a true value is faster as more observations are added (Stock, 1987; Engle and Granger, 1987; Muscatelli and Hurn, 1992).

In regard to exchange rates and prices, like other macroeconomic time series, are expected to be stochastic and non-stationary so that the use of classical statistical inferences become inappropriate. The implication of PPP ensures the movement between exchange rates and prices that will not drift away without bound. Therefore, equilibrium will be established in the long run. Finding cointegration of the series provides a foundation for long run equilibrium, which allows for short run deviation from PPP. It means that there exists a linear combination of the series that to be stationary after cointegrated with the same order, even though the individual series is non-stationary. Stationarity series exhibit mean reverting behaviour with finite variance and a finite memory (Granger 1986). Moreover, the problem of simultaneity bias is resolved once cointegration is employed. The bias arises since exchange rates and prices may be treated as endogenous variables (Krugman, 1978; McNown and Wallace, 1990). If these series are cointegrated, the low frequency components of the series dominate the high frequency components in the regression and the direction of causality is observed. The correlation of regressor and the error are of a lower order than the variance of the regressor itself (Engle and Granger, 1987). This section therefore, applies integration and cointegration techniques to examine the behaviour of exchange rates and prices.

6.5.2 Integration and Cointegration Tests

The presence of a unit root suggests the series are non-stationary. Tests like Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF), and Phillips-Perron (PP) tests are applied. A series is stationary if its means, variance and autocovariances are independent of time. In other words, the error term is independently and identically distributed (i.i.d.). A series is said to be integrated of order *d*, if the series is stationary after differencing *d* times (i.e. $x_t \sim I(d)$). The Dickey-Fuller test is to find out the order of integration of the time series such that:

$$x_t = a + \gamma t + \beta x_{t-1} + e_t \tag{6.19}$$

where *t* is the deterministic trend and tests whether $\beta = 1$. Or if we reparameterize the regression:

$$\Delta x_t = a + \gamma t + (\beta - 1)x_{t-1} + e_t \tag{6.20}$$

and test the null hypothesis $(\beta - 1) = 0$. Critical values are tabulated in Fuller (1976) and Dickey and Fuller (1981). The error term of Eq. 6.20 is assumed to be i.i.d.. Lagged values of the dependent variable are added into the regression if the error term is not white noise. The Augmented Dickey Fuller test is therefore as follows:

$$\Delta x_t = \alpha + \gamma_t + (\beta - 1)x_{t-1} + \sum_{i=1}^{n} \delta_i \Delta x_{t-1} + \varepsilon_t$$

(6.21)

and t-statistics is used to test for (β - 1). Same critical values are applied. The third method is Phillips and Perron test. Phillips and Perron (1988); Perron (1988) generalize Dickey-Fuller procedure and develop a non-parametric unit root test which allows for weakly dependent and heterogeneously distributed innovations. The test is known as Z-statistics. Full details of explanation of the test can be seen in Perron (1988). The null hypothesis of the above three unit roots is $I(d)$ against $I(d\text{-}1)$.

Once the degree of integration of the series is found, cointegration technique is applied to test whether the series are cointegrated. Two series, x_t and y_t, are said to be cointegrated if both series have the same order d, and their linear combination is integrated to the order b, where b is less than d. We denote the cointegrated series as:

$$\begin{bmatrix} x_t \\ y_t \end{bmatrix} \sim CI(d,b)$$

For example, if the series x_t, y_t are order to one, i.e. $z_t \sim I(1)$, then their linear combination will be stationary of order 0, i.e. $CI(1,0)$. We can apply the unit root tests to the residuals (η_t) of the cointegrating regression in order to check for stationarity. This is called the residual-based approach of cointegration tests. Engle-Granger procedure is a two-step method to test for cointegration. The null hypothesis of no cointegration is tested against the alternative hypothesis of having cointegration. The residual equation is shown as follows:

$$\Delta\hat{\eta}_t = -\rho\hat{\eta}_{t-1} + \sum_{i=1}^{n} \theta_i \Delta\hat{\eta}_{t-i}$$

(6.22)

where the null hypothesis is $\rho = 0$ against $\rho \neq 0$. The Granger Representation Theorem states that if any two series are cointegrated, an error correction representation will be:

$$\begin{aligned} \Delta x_t &= -\hat{\eta}_1 z_{t-1} + lagged(\Delta x_t , \Delta y_t) + \mu_{1t} \\ \Delta y_t &= -\hat{\eta}_2 z_{t-1} + lagged(\Delta x_t , \Delta y_t) + \mu_{2t} \end{aligned}$$

(6.23)

z_t is the error correction term, capturing the degree of deviation from the long run equilibrium.

The Engle-Granger procedure of cointegration assumes that the cointegrating vector is unique and can only apply to bivariate series. The residual-based approach also has low power to reject the null hypothesis. Johansen (1988), Johansen and Juselius (1990) develop the maximum-likelihood (ML) approach to generate consistent ML estimates of a system of cointegrating vectors. This approach also produces likelihood ratio (LR) statistic for the maximum numbers of distinct vectors in the matrix. The advantage of using LR test statistics is to provide an exact known distribution which is a function of just one parameter; as opposed to the Engle-Granger approach which cannot be used to compare the critical values from the known distribution. Using matrix notation, Eq. 6.23 can be generalized as:

$$\Delta X_t = \sum_{i=1}^{k-1} \Gamma_i \Delta X_{t-i} - \Pi X_{t-k} + \mu + \varepsilon_t$$

(6.24)

$$\Gamma_m = -\left(I - \sum_{i=1}^{m} \Pi_i\right) ; \qquad \Pi = -\left(I - \sum_{i=1}^{k} \Pi_i\right)$$

(6.25)

where X_t is an nx1 vector, μ is the constant term, I is the identity matrix and Π is an nxn matrix which has rank $r < n$ if X_t is cointegrated. Π can be decomposed into two nxr matrices α and β and such that

$$\alpha\beta' = \Pi \qquad (6.26)$$

where β represents r cointegrating vector(s) that captures the long run equilibrium in X_t; and α displays the speed of adjustment in the error correction mechanism. Since it is impossible to estimate α and β directly, Johansen applies Maximum Likelihood procedure to estimate the matrices. First one regresses

ΔX_t and X_{t-k} on lags of ΔX_t respectively and obtains two residuals R_{0t} and R_{1t}. A product moment matrix is constructed as:

$$S_{ij} = T^{-1}\sum_{t=1}^{T} \hat{R}_{it}\hat{R}_{jt} \quad (i, j = 0, k)$$

(6.27)

The cointegration vectors can be found by the determinant of product moment matrix:

$$|\lambda S_{kk} - S_{ko} S_{oo}^{-1} S_{ok}| = 0$$

(6.28)

where λ comes from the squared canonical correlation of R_{0t} and R_{1t}. The roots $(\hat{\lambda}_1, \ldots, \hat{\lambda}_n)$ and the eigenvectors $(\hat{v}_1, \ldots, \hat{v}_n)$ which are normalized as $V'S_{kk}V = I_n$. The r cointegrating vectors are supplied by the most significant eigenvectors such that $\hat{\beta} = (\hat{v}_1, \ldots, \hat{v}_r)$. In order to determine r, Johansen (1988, 1989) uses two statistical tests: maximum eigenvector statistics which tests the null of rank equal to r against the alternative $(r - 1)$; and trace statistics which tests the full rank against alternative rank equal to r. Critical values are tabulated in Johansen (1989) and Johansen and Juselius (1990).

For our empirical study, we write PPP as follows:

$$s_t = \alpha_0 + \alpha_1 p_t - \alpha_2 p_t^{*} + \omega_t$$

(6.29)

The equation is in logarithmic form. s_t is the nominal effective exchange rate (domestic price of weighted foreign currencies), p_t and p_t^* are the effective domestic and foreign prices respectively. α_0 is the constant term and ω_t is the error term capturing any deviation from long run equilibrium. Stationarity of ω_t ensures the establishment of long run PPP. As stated in the previous section, we use arithmetic and geometric averaging concept to construct effective exchange rates and prices. Moreover, *a priori* restriction is imposed on the cointegration regression and test whether *a priori* restrictions will eventually cause rejection of cointegration (Pippenger, 1993; Cheung and Lai, 1993a). Hence all five methods for testing PPP, including unrestricted and restricted equations, are examined by using the cointegration techniques:

Unrestricted Equations: Annotation

Method 1: $s_t = p_t - p_t^*$

$$NAW_t = \alpha_{10} + \alpha_{11}IP_t - \alpha_{12}PRA_t \tag{6.30}$$

$$NGW_t = \alpha_{13} + \alpha_{14}IP_t - \alpha_{15}PRG_t \tag{6.31}$$

Restricted Equations[4]:

Method 2: $s_t = (p_t - p_t^*)$

$$NAW_t = \alpha_{20} + \alpha_{21}(IP\text{-}PRA)_t \tag{6.32}$$

$$NGW_t = \alpha_{22} + \alpha_{23}(IP\text{-}PRG)_t \tag{6.33}$$

Method 3: $(s_t - p_t) = -p_t^*$

$$(NAW\text{-}IP)_t = \alpha_{30} + \alpha_{31}PRA_t \tag{6.34}$$

$$(NGW\text{-}IP)_t = \alpha_{32} + \alpha_{33}PRG_t \tag{6.35}$$

Method 4: $(s_t + p_t^*) = p_t$

$$(NAW+PRA)_t = \alpha_{40} + \alpha_{41}IP_t \tag{6.36}$$

$$(NGW+PRG)_t = \alpha_{42} + \alpha_{43}IP_t \tag{6.37}$$

Method 5: $p_t = -(s_t + p_t^*)$; $(s_t + p_t^*) = -p_t$

$$IP_t = \alpha_{50} + \alpha_{51}PAW_t \tag{6.38}$$

$$PAW_t = \alpha_{52} + \alpha_{53}IP_t \tag{6.39}$$

$$IP_t = \alpha_{54} + \alpha_{55}PGW_t \tag{6.40}$$

$$PGW_t = \alpha_{56} + \alpha_{57}IP_t \tag{6.41}$$

For Method 5, we adopt Bahmani-Oskooee's (1993a, 1993b) approach to construct the weighted average of exchange rate adjusted price levels, (PAW and PGW), and investigates the relationship of these effective exchange rate adjusted prices with domestic prices. Since different number of lags may be sensitive for the empirical results, the selection of appropriate lags is therefore crucial for testing PPP. We use Schwert's (1987) formula[5] in determining the number of lags. Based on sample size of 60 observations, the maximum lag length is 3 for the quarterly data.

6.5.3 Empirical Results

We first estimate the variables (PAW, PGW, IP, PRA, PRG, NAW, NGW, REA and REG)[6] for the degree of integration. Unit root tests are applied by using DF, ADF and PP tests. Table 6.2 shows the unit root tests on the *level* of the variables. A constant and a trend are included in the regression. Critical values are found in MacKinnon (1990). The hypothesis of I(1) cannot be rejected in all cases at 5% significant level, except IP in ADF test which appears to be stationary. In order to confirm the degree of integration, we take *first differencing* of the series and continue to carry out the unit root test. We find that the series are all rejected at 5% significant level except IP that is rejected at 10% level. Table 6.3 reports the results. The findings suggest that the *level* of all series is indeed non-stationary.

Table 6.4 shows the residual based test of cointegration. The tests explore the stationarity for the residuals of the cointegrating regression. Method 1 are the two unrestricted equations, regressing nominal effective exchange rate against domestic and effective foreign prices (Eqs. 6.30 - 6.31). Methods 2 to 4 are *a priori* restricted equations. Method 5 examines real effective exchange rates by using Bahmani-Oskooee's approach. For all the residual based cointegration tests (DF, ADF and PP), we cannot find any statistical significance against the alternatives at either 5% or 10% level. It indicates that exchange rates and prices are drifted apart without any potential tendency to converge, even though the data are constructed by weighted average to mitigate any strong correlation of "one single country effect" to the domestic country.

Johansen's maximum likelihood test provides a more reliable test for cointegration. The estimation can increase efficiency against single equation and eradicate simultaneous equation bias (Phillips 1991). This is relatively important for the investigation of PPP since exchange rates and prices are usually committed to the problem of simultaneity (Krugman, 1978; Frenkel, 1981; McNown and Wallace; 1990). Using the Monte Carlo experiments, Cheung and Lai (1993a) find that there is a potentially powerful advantage of Johansen test over the residual based approach. They assert that "the residual based test have very low power in rejecting the no cointegration hypothesis even when an equilibrium relationship in fact holds in the long run with a reasonable speed at which deviations from equilibrium are corrected" (p.185).

Tables 6.5 and 6.6 show the Johansen's cointegration tests. The Tables report the likelihood ratio tests of maximal eigenvalue statistics (Table 6.5) and trace statistics (Table 6.6) [7]. A small sample correction has been investigated by Reimers (1992) for calculating the test statistic for contegrating rank. The critical value is based on the likelihood-based inference simulated by Johansen (1995). In both of the statistical inferences, we conclude that only the unrestricted equation {NAW, IP, PRA} does the null hypothesis of no-cointegration has been rejected in the trace statistic by 10% significant level. In *a priori* restricted equations, none of the cointegrating vector is found in Method 2 {NAW IPPRA; NGW, IPPRG}, Method 3 {NAWIP, PRA; NGWIP, PRG}, Method 4 {NGWPRG, IP} and Method 5 {PAW, IP; PGW, IP}. The above findings draw some interesting particulars:

1) Using Johansen's ML procedure provides a powerful alternative test for the multivariate cointegration when the small sample size is corrected. There is at least one cintegrating vector that is found in the unrestricted equation. This is a direct contrast to the residual based cointegration technique, which always has low power to reject the zero cointegration null hypothesis. The arguments are in line with Cheung and Lai (1993a) and Kugler and Lenz (1993).

2) Johansen suggests two likelihood ratio test, namely, maximal eigenvalue and trace statistics to perform statistical results. Cheung and Lai (1993b) use response surface analysis in Morte Carlo experiments to report the finite sample critical values of the LR test statistics. They find that of the Johansen's two test statistics, the trace test shows more robustness to the skewness and excess kurtosis in innovations than the maximal eigenvalue test. Therefore, trace statistic provides a reliable statistical inference than the maximal eigenvalue test.

3) Some researchers argue that *a priori* restriction on testing PPP may neglect information about the short run dynamic in the long run movement. It is because the restricted models ignore any interactions in the determination of exchange rates and prices, which are allowed in the unrestricted equations. Hence *a priori* restrictions usually lead to zero cointegration of PPP (Cheung and Lai, 1993a; Pippenger, 1993). In the paper of Pippenger, he argues that restricted models may have led to their failure to find long run relationship between exchange rates and prices indices and imposition can cause failure of the tests to support the hypothesis of cointegration (p.58). Our findings show that none of the restricted equations indicates a long run

cointegrating relationship between prices and exchange rates. The results are contrast to Mahdavi and Zhou, (1994); Phylaktis, (1992); Chowdhury and Sdogati, (1993), where they impose *a priori* restriction to PPP that leads to the support the long run PPP.

4) Using Bahmani-Oskooee procedure (Method 5) to construct the weighted average of exchange rate adjusted price indices, we cannot reject the null hypothesis of no cointegration in both pairs of the series, {PAW IP} and {PGW IP}. The result supports to Bahmani-Oskooee's paper (1993a) that little empirical support of PPP is found in the LDCs.

5) The outcomes of the tests are not sensitive to the choice of weighted average techniques. Officer (1980) prefers using geometric weighted averaging to arithmetic averaging, as the first is subject to a symmetry and reversibility property. However, we cannot make a conclusive judgement on the construction of weighted techiques..

Since the group {NAW IP PRA} is found to have at least one cointegrating vector by using the trace statistics, we need to interpret the values of α and β. Table 6.7 shows the normalized estimated cointegrating vector (β) and the normalized estimated adjustment matrix (α). The parameter β captures the long run relationship in the matrix whilst α represents the speed of adjustment in the error correction mechanism. The interpretation of cointegrating vector is that a 1% depreciation of nominal effective exchange rate (NAW) leads to a 4.2% rise in domestic price (IP) and 3.4% falls in the foreign effective price (PRA). In view of the error correction modelling, a higher rise in domestic price requires bigger movement to get back to long run equilibrium. For the speed of adjustment, both movements of IP and PRA are relatively slow to return to equilibrium.

6.5.4 The Dynamics of Adjustment (ECM Modelling)

Another procedure to examine the dynamic adjustment is to construct an error correction term in the equations. Engle and Granger (1987) develop the General Representation Theorem and shows that if two series are cointegrated, there exists an error correction term (ECM) in the equation. Using the series of {NAW IP PRA}, the vector ECM (VECM) equations are written as follows:

$$\Delta NAW_t = \alpha_{10} + \alpha_{11} ECM_{t-1} + \sum_{i=1}^{n} \gamma_{1i} \Delta NAW_{t-i} + \sum_{i=1}^{n} \delta_{1i} \Delta IP_{t-i} + \sum_{i=1}^{q} \theta_{li} \Delta PRA_{t-i} + \mu_{1i} \tag{6.42}$$

$$\Delta IP_t = \alpha_{20} + \alpha_{21} ECM_{t-1} + \sum_{i=1}^{m} \gamma_{2i} \Delta IP_{t-i} + \sum_{i=1}^{n} \delta_{2i} \Delta NAW_{t-i} + \sum_{i=1}^{q} \theta_{2i} \Delta PRA_{t-i} + \mu_{2i} \tag{6.43}$$

$$\Delta PRA_t = \alpha_{30} + \alpha_{31} ECM_{t-1} + \sum_{i=1}^{m} \gamma_{3i} \Delta PRA_{t-i} + \sum_{i=1}^{n} \delta_{3i} \Delta IP_{t-i} + \sum_{i=1}^{q} \theta_{3i} \Delta NAW_{t-i} + \mu_{3i} \tag{6.44}$$

The above ECMs shows how the system converges to the long run equilibrium denoted by the cointegrating regression. NAW, IP, and PRA are the dependent variables in Eqs. 6.42, 6.43 and 6.44 respectively. We want to know whether the dynamic change is due to the changes in nominal effective exchange rates and/ or the prices. The VECMs are actually the residuals of Eq. 6.30.

Zellner (1962) points out that the Seemingly Unrelated Regression method (SURE) is more efficient than OLS equation by equation, because it can take care the problem contemporaneous correlation. We use the log-likelihood ratio statistic for testing the diagonality of the error covariance matrix. That is to say, we test whether the contemporaneous correlation among the residuals from the set of equations is statistically significant. If the contemporaneous correlation is found, the SURE method will give a full efficient estimation of the equations than OLS estimation of each equation.

Table 6.8 shows the log-likelihood (LR) ratio statistic for testing the diagonality of the error covariance matrix. The LR statistic is 2.0834. The 95% critical value of the chi-squared distribution with 3 degrees of freedom is 7.831. Hence, we cannot reject the hypothesis that the error covariance matrix of the set of equations is diagonal, and the application of SURE may not increase the efficiency of the estimation of equations. OLS is used to estimate the value of VECMs. The coefficient of the vector error correction terms and the t-ratio when models were estimated with two lags are reported. Table 6.9 shows that all the

VECMs have correct negative sign. The coefficients of VECMs for nominal exchange rate and domestic prices are statistically insignificant at 5% level. Only the coefficient of VECM in the foreign price equation is negative and statistically significant. It implies that deviation of prices will be corrected from long-run equilibrium. Moreover, the diagnostic tests show no signs of statistical significance for the foreign price equation. The long-term stability of real exchange rate is therefore the consequences of the changes of the foreign prices. The argument is in line with Siregar (1996) that the managed floating policy in Indonesia has been inflationary. There was an inflationary cost for managing the rupiah exchange rate and only the changes of foreign price would lead to the long run stability of real exchange rate.

6.5.5 Concluding Remarks

By using integration and cointegration procedures, we conclude that the series of exchange rates and prices are non-stationary. Cointegration is only found in the unrestricted equations when Johansen's ML test is applied. Generally speaking, the study finds evidence in favour of long run PPP regardless of any *a priori* restriction in the equations. The short run deviation may be caused by the devaluation policy of the Indonesian government, the differential speed of adjustment in goods and asset market (Dornbusch, 1976a) and the presence of measurement error and/or transaction costs (Taylor, 1988; Davutyan and Pippenger, 1990).

6.6 Testing Symmetry and Proportionality

6.6.1 Introduction

Testing the validity of PPP depends on the restriction on the coefficients of the vectors. This implies an examination to the symmetry and proportionality of the equations. The rejection of the null hypothesis of symmetry and proportionality signifies the invalidity of PPP. Recall Eq. 6.29, it states that long-run proportionality between nominal effective exchange rate and prices implies $\alpha_1 = \alpha_2 = 1$; whilst symmetry requires $\alpha_1 = \alpha_2$. Previous cointegration technique manifests the condition that if the nominal exchange rate and price are individually following an I(1) process, then their linear combination is stationary of order 0, and hence the real fundamentals such as the real exchange rate will be itself stationary. Nevertheless, stationarity of real exchange rate implies the long run proportionality of PPP equation. This is a strong form of PPP. In other words, PPP may doom to fail because the estimated cointegrating coefficient is statistically different from 1. In some cases, empirical studies show that using cointegration method to test PPP is not supportive for long run proportionality between exchange rates and prices (Giovannetti, 1992). In their empirical research, Cheung and Lai (1993a) use a chi-square test developed by Johansen and find that "in nine out of ten cases the restriction of either symmetry or proportionality is rejected statistically by the data." Their conclusion is that the rejection highlights the desirability to apply unrestricted trivariate model in testing cointegration and long run PPP (p.188). Taylor (1988), by allowing for measurement error and/or transportation costs in the equation, argues that PPP hypothesis is extremely unfavourable. He claims that "........rather than finding evidence of stable, long-run proportionality between exchange rates and prices, we were unable to reject the hypothesis that they tend to drift apart from bound" (p.1377). Krugler and Lenz (1993) agree with Taylor's claim and support a weaker variant of PPP for four countries. Conejo and Shields (1993) shows that in five Latin American countries, three of them are rejected for long run PPP; and only Mexico and Brazil show that restricted coefficients are close to one for both CPI and WPI. Chowdhury and Sdogati (1993) assert that the departure from a unity coefficient does not necessarily imply no cointegration between the exchange rate and price series, it may implies that the real exchange rate is not stationary in some structural breaks. Fraser and *at.al.* (1991) use disaggregated price indices of manufactured commodities and conclude the results of being extremely unfavourable to PPP. Edison and Klovland (1987) impose proportionality condition and also find the rejection of the null hypothesis. On the other hand, Moosa (1994) finds stronger support of proportionality and symmetry in the cointegrating equations. Phylaktis (1992) imposes restriction of unity in the relative prices and finds the stationarity of real exchange rate which provides supportive evidence for PPP.

Since most of the studies reject proportionality and symmetry in the cointegrating regressions, it is interesting to know whether these restrictions are present in the coefficients. As a result, we will test the proportionality and symmetry assumptions to the coefficients of the cointegrating equations. Three possible statistical tests are employed: 1) 't'-statistics based on White's HCSEs test (1980). The statistics correct the problem of heteroscedasticity that usually emerges in the OLS regression; 2) Johansen's restricted test with a chi-square distribution; and 3) the restricted cointegration test[8] (RCT) developed by Liu and Maddala (1992). The RCT is based on the cointegration regression of DF, ADF and PP tests. We use Schwert's (1987) method to determine the number of the lags.

6.6.2 Testing Procedures

Recall the unrestricted and restricted equations:

$$s_t = \alpha_0 + \alpha_1 p_t + \alpha_2 p_t^* + \mu_t \tag{6.45}$$

$$s_t = \beta_0 + \beta_1 Z_t + \lambda_t \tag{6.46}$$

where s_t is the nominal exchange rate, p_t and p_t^* are the domestic and foreign price indices. Z_t is the restricted variable(s), μ_t and λ_t are the error terms. Five null hypotheses are formed and the test specifications are assigned according to the unrestricted and / or restricted equations. The null hypotheses against the alternatives are shown as follows:

H1: $\alpha_1 = -\alpha_2$

H2: $\alpha_0 = 0; \alpha_1 = 1, -\alpha_2 = -1$

H3: $(\alpha_0) = 0$ and $\beta_0 = 0$

H4: $(\alpha_1) = 0$ and $\beta_1 = 1$

H5: $\beta_0 = 0$ and $\beta_1 = 1$

Testing the unrestricted equations (Method 1) comprises the null hypothesis of H1 to H4; whilst the restricted equations (Method 4, 5 & 6) covers H3 to H5.

6.6.3 Empirical Results

Table 6.10 shows the testing of symmetry and proportionality of the unrestricted and restricted equations. The hypothesis of H1 shows that the properties of symmetry cannot be rejected in the two unrestricted equations. The results are carried out by Johansen's restricted test with chi-square one degree of freedom. The outcome is reasonable because previous studies have shown that the unrestricted equation is free from bias towards accepting no cointegration. H2 tests the restriction of [0, 1 -1,] and the null of proportionality cannot be rejected by Johansen test. The result is confirmed by the restricted cointegration test (RCT). In all the three test procedures, DF, ADF and PP tests cannot reject the null hypothesis. The hypothesis of H1 and H2, therefore, not only show the symmetry and proportionality of the equations, but also reaffirm the cointegration of the three series. Cointegration is a long run equilibrium phenomenon.

H3 tests a zero intercept in the unrestricted and restricted equations. White's HCSEs are used because the standard errors of OLS do not show a limiting normal distribution (Moosa, 1994). However, the null hypothesis of zero intercept is rejected in all cases except the series of {NAW IP PRA}. The constant term can be interpreted as a trend in the long run terms of trade if the series are cointegrated (Conejo and Shields, 1993). If the constant term, α_0 , $\beta_0 > 0$, the long run terms of trade will move against the home country, which is implied by the Prebisch-Singer hypothesis.[9] The constant terms of the two unrestricted equations are negative values, asserting that Indonesia is not a country mainly depending on the export sales of primary products.

The unitary null hypothesis of H4 is rejected only in the restricted equations. The rejection of coefficients, β_1 indicate the unnecessary restriction in the restricted equations. The last null hypothesis H5 is only rejected by the Johansen restricted test for the series of {PGW IP}. In a nutshell, the overall empirical results provide stronger evidence of symmetry and proportionality properties than the above mentioned studies.

6.7 Issues on Structural Break

6.7.1 Introduction

Nelson and Plosser (1982) challenge the traditional view that current shocks have only temporary effect. They argue that current shocks have permanent effect in the long run for most economic and financial aggregates. When applying to the Dickey-Fuller (1979, 1981) unit root tests, they find that most of the macroeconomic time series are actually non-stationary. In fact, those aggregates have the properties of difference-stationary (stochastic) (DS) and trend-stationary (deterministic) (TS) processes. The stochastic process implies that random shocks have permanent effects on the system. Cochrane (1988), Campbell and Mankiw (1987) also assert that the long run property of a time series is affected by the size of the shocks. The unit root theory contributes profound investigation and econometric application to the business cycle theories, asset pricing models and the alike. Cochrane applies the variance ratio test to study the size of a random walk of GNP and states that the short run properties of GNP (deviation) is consistent with a model of persistent shocks (1988).[10] However, Perron (1989) argues that "most of the macroeconomic time series are not characterized by the presence of a unit root and that fluctuations are indeed transitory" (1989, p.1362). He suggests that only the Great Depression of 1929 and oil shock of 1973 have permanent effects on the various time series. By allowing one time single change in the intercept and/or the slope, the series would be stationary around the deterministic trend. It means that the break acts as a buffer by removing the influence of the shocks from the noise function. He treats the shocks (Great Crash and oil price) as exogenous in the sense that shocks are not the realization of data-generating mechanism of the series.

In this section, we try to apply Perron's structural break test to the nominal and real effective exchange rates. By applying one time single change in the intercept / slope, the series would be stationary around the deterministic trend. The structural break is important in investigating the exchange rate movements. There were 1983 and 1986 devaluations in Indonesia. Prior to the 1983 devaluation, Indonesia suffered from capital outflow and a loss in international reserve due to severe deficit in the trade balance. In order to improve the current account and stop capital flight, devaluation was introduced in March 1983. The price of Rupiah was drastically fell against per US dollar. Hobohm (1987) argues that devaluation was an essential step to diversify the industries from oil-related sector and to improve the efficient utilization of resources, both in external and internal sectors. On the other hand, the 1986 devaluation led to sharp decline in oil price. With further trade liberalization and greater investment opportunities, devaluation would lever off the overpricing of the currency and reduce the possible bias of export protection system. Anwar *et. al.* (1991) states that "the government has since adopted an active exchange rate policy of maintaining the competitiveness of the real exchange rate by controlling for inflation as well as depreciating the Rupiah gradually, and this was an important factor in increasing non-oil exports." The two devaluations actually provide good empirical study for the movement of exchange rates. Applying Perron's structural break test will justify whether fluctuations of the series are indeed stationary around the deterministic trend function. Traditional structural break test like Chow test can only examine the statistical stability on the coefficients of the equations, but the time series properties that mentioned above are completely neglected. Moreover, split sample regressions have always been subject to low power for rejection of a unit root, and a test statistic allowing for the presence of a change in mean is imperative for testing alternative hypothesis (Perron (1990); Perron and Vogelsang (1992)). Hence Perron's method satisfies the above justifications. We use March, 1983 and September, 1986 to be the one time single break since devaluations have made Rupiah fall by 28% and 31% against US dollar accordingly. Figures 6.5 to 6.6 show that there are big movement of the exchange rates after devaluations and Perron's method can provides good empirical testing.

6.7.2 Structure Change in Mean

In Perron's paper (1989), a given time series $\{y_t\}_1^T$, has a unit root with nonzero drift which can be allowed to have a one time change in the structure at time T_B, where T_B is $1 < T_B < T$. The unit root null hypothesis is then tested against the alternative that the series is stationary about a deterministic trend with an exogenous change in the trend function at T_B. Perron suggests three different models against the unit root null hypothesis:

$$Model(A): \quad y_t = \mu + dD(TB)_t + y_{t-1} + e_t \tag{6.47}$$

$$Model(B): \quad y_t = \mu_1 + y_{t-1} + (\mu_2 - \mu_1)DU_t + e_t \tag{6.48}$$

$$Model(C): \quad y_t = \mu_1 + y_{t-1} + dD(TB)_t + (\mu_2 - \mu_1)DU_t + e_t \tag{6.49}$$

where $D(TB)_t = 1$ if $t = T_B + 1$ and 0 otherwise; $DU_t = 1$ if $t > T_B$, and 0 otherwise; and $A(L)e_t = B(L)v_t$; $v_t \sim$ i.i.d. $(0, \sigma^2)$, with $A(L)$ and $B(L)$ are pth and qth order polynomials in the lag operator L respectively. Perron states that Model (A) permits an exogenous change in the level of the series ("crash"); Model (B) permits an exogenous change in the rate of growth; and Model (C) allows both changes. For the alternative hypothesis, the series $\{y_t\}$ is stationary about the deterministic trend with time invarying parameters. The three alternative models are:

$$Model(A): \quad y_t = \mu_1 + \beta t + (\mu_2 - \mu_1) DU_t + e_t \tag{6.50}$$

$$Model(B): \quad y_t = \mu + \beta_1 t + (\beta_2 - \beta_1) DT_t^* + e_t \tag{6.51}$$

$$Model(C): \quad y_t = \mu_1 + \beta_1 t + (\mu_2 - \mu_1) DU_t + (\beta_2 - \beta_1) DT_t + e_t \tag{6.52}$$

where $DT_t^* = t - T_B$, and $DT_t = t$ if $t > T_B$ and 0 otherwise. Under the alternative hypothesis, Model (A) refers to the "crash model" and allows for a one time change in the intercept of the trend function. Model (B) refers to the "changing growth" model and allows for a change in the slope of the trend function occurring at time T_B. And Model (C) permits the changes of "level" and "slope" of the trend function.

Perron further extends Dickey-Fuller (ADF) type unit root test in Models (A) to (C) and the corresponding models are as follow:

Model (A),

$$y_t = \hat{\mu}^A + \hat{\theta}^A DU_t + \hat{\beta}^A t + \hat{d}^A D(TB)_t + \hat{\alpha}^A y_{t-1} + \sum_{i=1}^{k} \hat{c}_i \Delta y_{t-i} + \hat{e}_t \tag{6.53}$$

Model (B)[11],

$$y_t = \hat{\mu}^B + \hat{\theta}^B DU_t + \hat{\beta}^B t + \hat{\gamma}^B DT_t^* + \hat{\alpha}^B y_{t-1} + \sum_{i=1}^{k} \hat{c}_i \Delta y_{t-i} + \hat{e}_t \tag{6.54}$$

Model (C),

$$y_t = \hat{\mu}^C + \hat{\theta}^C DU_t + \hat{\beta}^C t + \hat{\gamma}^C DT_t + \hat{d}^C D(TB)_t + \hat{\alpha}^C y_{t-1} + \sum_{i=1}^{k} \hat{c}_i \Delta y_{t-i} + \hat{e}_t \tag{6.55}$$

where TB is the period at the end of which the break occurs;

$DU_t = 1$ if $t > TB$, and 0 otherwise;

$D(TB) = 1$ if $t = TB + 1$ and 0 otherwise;

$DT_t^* = t - TB$ if $t > TB$ and 0 otherwise; and

$DT_t = t$ if $t > TB$ and 0 otherwise;

all error terms are i.i.d. $(0, \sigma^2)$.

For testing the unit root, Perron compares the statistics of all $\hat{\alpha}^i = 1$ against $\hat{\alpha}^i < 1$ (i = A, B or C). The statistics depend on the size of λ, i.e. the break point. λ is actually the ratio of T_B to T ($\lambda = T_B/T$). Rejection of a unit root implies $\hat{\alpha}^i(\lambda) < \hat{\alpha}_i^*(\lambda)$. The critical values of $\hat{\alpha}_i^*(\lambda)$ are reported in Perron (1989).

6.7.3 Empirical Results

Table 6.11 shows the descriptive statistics of the real and nominal effective exchange rates, using 1983Q2 as the one time structural break. The mean values for the second sample period, i.e. the post-devaluation period, is higher than the first sample period in all the exchange rates presented. The same result is also shown in Table 6.12, when 1986Q3 is used as the one time structural break. Devaluation causes effective exchange rate to move upward while allowing a shift in intercept and/ slope of the trend function. Therefore, three models suggested by Perron are used to test the null hypothesis of a unit root.

Tables 6.13 and 6.14 show the results of the three models (A, B and C) for the real and nominal effective exchange rates. The value of λ in Table 6.13 is 0.33 as 1983Q2 is the one time structural break, whilst the value of λ in Table 6.14 is 0.53 when 1986Q3 is allowed for one time break. Lag terms (k) are used from 1 to 4 to see whether the results are sensitive to the numbers of lags. Critical values for λs are reported in Perron (1989). The tables show that the null hypothesis cannot be rejected for any effective exchange rates. The number of lags is insensitive to the results.[12] The results are in contrast to some papers which use Perron's structural test for estimating macroeconomic time series. Perron (1989), Serletis (1992b) reject the unit root in estimating GNP trends. Duck (1992), Georgellis (1994) also find rejection of macro time series in UK. However, one of the problems in Perron's test is the choice of the time break. Perron treats the break as exogenous and is known as *a priori* or is uncorrelated to the data. Zivot and Andrews (1992), Perron and Vogelsang (1992), Banerjee & *at.al.* (1992) endogenise the break point selection. Zivot and Andrews reverse some Perron's conclusion in rejecting a unit root. Banerjee & *at.al.* fail to reject the null for five OCED countries. We can foresee the advantages by endogenising the unknown break point procedure, however, the core of the section is to understand the effects of devaluation to the changes of effective exchange rates. *A priori* known break point therefore, is essential for our estimation.

6.7.4 Conclusion

The empirical result shows that we cannot reject the unit root hypothesis even though Perron's break point procedure is employed. It means that the presence of stochastic effect is strong in the exchange rate series. Therefore, it is necessary to further investigate the persistent effects of the series. Variance Ratio test, like Cochrane's (1988) is used for estimation. This leads to the next section. For the policy implication, the stochastic process mainly drives exchange rate changes. Devaluation increases the fluctuation of the effective exchange rates. Reversal to long-run equilibrium level is impossible in a short time span. The authority has to keep close eyes on the short run exchange rate volatility. Devaluation policy should be carefully operated with the implementation of monetary and financial policies. That would minimise the volatility of exchange rate in the short run.

6.8 Persistence and the Size of the Random Walk

6.8.1 The Background

Previous unit root tests suggest the presence of random walk in the exchange rate. The short run deviation do not provide explanation to the mean reversion of the exchange rate. This section considers the persistent effect on the exchange rate driven by the random walk process. Hence, we analyze the size of the random walk for nominal and real effective exchange rates.

The random walk model is a proper subset of the unit root null hypothesis (Lo and MacKinlay, 1989). They states that "recent applications of unit root tests propose the null hypothesis that the random walk component does not exist, whereas tests of the random walk have as their null hypothesis that the stationary component does not exist (p.205)." Therefore, random walk process is basically different from the unit root type. In the papers of Beveridge and Nelson (1981) and Nelson and Plosser (1982), they argue that most of the macroeconomic time series are non-stationary, like GNP, and can be decomposed into difference-stationary (DS) and trend-stationary (TS) process. If the series is DS, the effect of a shock would be permanent. A time series captures a random walk with drift can be shown as:

$$y_t = \alpha + y_{t-1} + \varepsilon_t \tag{6.56}$$

where ε_t is an i.i.d.. If in some periods, there is a jump K in ε_t of the series y_t, and such that y_t, y_{t+1}, y_{t+2},....,y_{t+n} are all increased by K, the effect of a shock (possibly real) on y_t is permanent. The series is non-stationary and there is no tendency to revert to a trend line. On the other hand, if the series is as follows:

$$y_t = \theta y_{t-1} + \varepsilon_t \tag{6.57}$$

and $|\theta|$ is less than 1. The effect of a shock (possibly monetary) on y_t will be died down since a jump K on ε_t with y_t leads to consecutive increase by $K\theta$, $K\theta^2$, $K\theta^3$,......, $K\theta^n$. The value of $K\theta^n$ becomes K as $n \to \infty$. Hence, DS shows only temporary deviation about trend. Testing the random walk hypothesis is important to the exchange rate movement. If the random walk component is large and persistent, PPP will not hold in the long run. PPP is a long run concept, permanent shock on exchange rate implies there is no tendency of mean-reversion in the long run. Phylaktis and Kassimatis (1993) measure the size of random walk of the black exchange rate markets in the Pacific Basin countries. They find that the relative importance of random walk component is small and thus, their result support PPP.

Investigating the size of the random walk is crucial to the exchange rate changes. First, real exchange rate is composed of nominal exchange rate and relative prices. Large portion of random walk component causes nominal exchange rate and prices to drift apart. In other words, those series are not cointegrated with I ~ (0). Real exchange rate usually measures a domestic country's trade competitiveness vis-à-vis foreign countries, no mean-reverting of the real rate in the long run reduces the creditability of monetary and financial polices to control monetary flows. Moreover, if PPP does not hold in the long run, firms will confront with economic exposure of the exchange rate fluctuation. A firm's value will be directly affected by the rise of investment and exchange risks (Logue and Oldfield 1977). Technically speaking, previous statistical tests of Dickey and Fuller (1979, 1981) assume that the error terms are i.i.d. normal random variables with constant variance. However, the nature of exchange rates series are typically subject to heteroscedasticity and non-normality (Liu and He, 1991a; 1991b). The application of Dickey-Fuller tests may give inaccurate results in testing the random walk hypothesis. Table 6.15 shows a summary statistics for the change of nominal and real effective exchange rates. It indicates that all the series are asymmetric with 'fat' tails. This can be shown by positive values of the skewness and significant level of excess kurtosis. The last row also reports the non-normality of the series which are statistically significant at 5% level. The summary statistics give the idea that using Dickey-Fuller tests for random walk hypothesis are not appropriate. The exchange rate series are actually non-normally distributed and the variances are time-varying. The purpose of this section therefore, by applying Cochrane's variance ratio to the nominal and real effective exchange rates, is to estimate the size of random walk in those series. Secondly, recent literature mostly apply the test to the industrialized countries, (Ardeni and Lubian, 1991; Urrutia, 1992; Fung and Lo, 1992), and few are drawn from the developing countries, except from those of Phylaktis and Kassimatis (1994). Indonesia is the example.

6.8.2 Variance Ratio Test

Lo and MacKinlay (1988, 1989) design a rigorous statistic test for random walk hypothesis. Using stock prices for empirical studies, they develop a test "which is sensitive to correlated price changes but is otherwise robust to many forms of heteroscedasticity and nonnormality" (1988, p.44). The statistic test is called the variance ratio test. They argue that the variance of random walk increments is linear to sampling interval (1989, p.44). The variance of quarterly increments are three times as large as the variance of monthly difference. That is, the variance of its k-differences will be k times the variance of the first difference. Cochrane (1988), in measuring the size of the random walk in GNP, redevelops the variance ratio statistic test. The test is a measure of persistence and is estimated nonparametrically and robust to heteroscedasticity and non-normal random disturbances. He says that "if the variance of the shocks to the random walk component is zero, the series is trend-stationary, and long-term forecasts do not change in response to shocks. If the variance of the shocks to the random walk component is equal to the variance of first differences, the series is a pure random walk. ...... there is a continuous range of possibilities between zero and one and beyond one" (p.895). He also argues that the distribution theory is sensitive to the presence of random walk component. The measurement of the size of random walk component serves "a better guide to the proper procedure than a unit root test because if the random walk component is small and nonzero, then an asymptotic distribution theory based on trend stationarity may provide a better approximation in a given small sample than the theory based on a unit root" (p.896). The intuition behind Cochrane's is as follows:

Suppose a series is a random walk with drift and such that:

$$Y_t - Y_{t-1} = \delta + \varepsilon_t \tag{6.58}$$

Cochrane states that the variance of its k-differences grows linearly with the difference k (p.898). It means that the variance of the k-differences must be k times the variance of its first difference. i.e.

$$Var(Y_t - Y_{t-k}) = Var(Y_t - Y_{t-1}) \cdot k \tag{6.59}$$

or

$$\frac{1}{k} \cdot \frac{Var(Y_t - Y_{t-k})}{Var(Y_t - Y_{t-1})} \tag{6.60}$$

If we let $Var(Y_t - Y_{t-k})$ be σ_k^2 and $Var(Y_t - Y_{t-1})$ be σ_1^2, the null hypothesis of testing a random walk is:

$$H_0 = \sigma_k^2 / \sigma_1^2 = 1, \text{ against} \tag{6.61}$$

$$H_1 = \sigma_k^2 / \sigma_1^2 \neq 1 \tag{6.62}$$

6.8.3 Literature Review

The use of variance ratio test has drawn attention to the presence of random walk component in the macroeconomic time series as well as the asset pricing of financial data. Lo and MacKinlay (1988) reject the random walk model in the weekly stock market returns and thus find no support of a mean-reverting model of asset prices. MacDonald and Power (1992) test the persistence of UK stock market returns. The finding of rejection of random walk is similar to those of Lo and MacKinlay (1988). Frennberg and Hansson (1993) test the random walk hypothesis on the Swedish stock prices. They discover that the pricing behaviour in Sweden is in line with recent research in the US stock market. The stock prices behave positive and negative autocorrelation in the short and long term respectively, which are opposed to the serial independence interpreted by the random walk hypothesis. Peterson & *et. al.* (1992) use Lo and Mackinlay's variance ratio test to test cash prices of 17 commodities. They also find no support of random walk hypothesis for the daily commodity prices. Fung & *et. al.* also apply variance ratio test in the stock index futures and find the existence of dependency in the asset prices. Using Cochrane's variance ratio test, Cochrane (1988) finds little support of long term persistent effect in GNP. Moreover, Serletis (1992) supports Cochrane's claim that the Canadian output is partially influenced by permanent and partially by deterministic components. He further argues that the rejection of a random walk may be different if an one time break in the intercept or on the slope is allowed. In this case, a Perron-type procedure and a split sample are appropriate (p.405). Malliaris and Urrutia (1991) confirms the random walk hypothesis and indicate that the hedge ratios and the measures of hedging effectiveness of stock indexes and foreign currencies contain a large permanent component and a small temporary component. On the other hand, some of the literature also use variance ratio test in the foreign exchange market. Liu and He (1991a, 1991b) apply Lo and MacKinlay's variance ratio test in the foreign exchange rates and find that autocorrelation is present which can be explained by overshooting or undershooting, risk aversion, and official intervention in the exchange markets (1991a, p.780). Applying the PPP concept, Glen (1992) tests the monthly and annual data of real exchange rates. Both sources reject the random walk hypothesis but with different interpretation. While the rejection of the former is subject to positive correlated innovation, the latter confirms PPP is the long-run phenomenon and the series is mean-reverting. Fung and Lo (1992) use the data of the industrialized countries, they discover that random walk shock is quite persistent, suggesting PPP may indeed hold in the long run (p.565). Urrutia (1992) confirms the exchange rate movements of four developed countries following the random walk, which contains a large permanent component and a small stationary component. Ardeni and Lubian (1991) argue that it is doomed to fail to use monthly data for testing PPP. However, there is evidence for the long run equilibrium by using the annual data and the application of variance ratio also signifies some mean-reverting component of the series.

6.8.4 Empirical Results

We adopt Cochrane's variance ratio to estimate the size of a random walk in the nominal and real effective exchange rates. Using the formula of Eq. 6.61, Tables 6.16 and 6.17 report the variance ratios of nominal and real effective exchange rates. Besides, Figures 6.7 to 6.10 plot the movement of the exchange rates, showing σ_k^2 increases with k and decreases after 25 lags. It means that the random walk component only reduce its size after sufficient lags of time. In our case, one lag equals to one quarter and the variance of k-differences declines after 8 years. The figures, therefore convince the wide fluctuation for the variance of k-difference and imply that the series do not follow a stationary trend. Table 6.16 and 6.17 display the results of the variance ratio tests. We construct the lags (k) up to 30. The variance ratio is 1 if k equals to 1. In general, the values of the variance ratio decline with k increases (except the initial lags for nominal and real rates as geometric approach is applied). The numerator, σ_k^2 represents the variance of the random walk in the k-difference. The test shows that the random walk component in the series reduces its influences as k increases. This conforms the result of Cochrane (1988) that the component of the macroeconomic series, like foreign exchange rates, is partly permanent and partly temporary. The influence of random walk component is strong in the initial (short-run) lags which gives similar result to Fung and Lo (1992) and Urrutia (1992).

Moreover, the size of random walk is associated to the choice of data construction. In the case of nominal and real rates, the random walk component approximately reduces half of its size after 8 lags when arithmetic approach is employed; whilst the size reduces by half after 13 to 17 lags when geometric approach is used. The choice of data construction is sensitive to the size of random walk. The short term deviation from PPP can be explained by the random walk component which causes nominal exchange rate and prices to drift apart. This also gives the idea about the short run deviation of exchange rates and prices. The argument is expounded by Glen as he says that "over the short run these (short-run) deviations do not provide evidence in favour of mean reversion in real exchange rates, at least not for periods of up to 32 months during the post-Bretton Woods era." Furthermore, the persistent effect in Indonesia is less than some developed countries which are empirically examined by Fung and Lo (1992) and Urrutia (1992). The reason for less persistent effect in Indonesia is partly due to the devaluation policy in the eighties. Devaluation reduced the overvalued rupiah vis-à-vis (mainly) the US dollar. Exchange rates and prices will be slowly adjusted towards equilibrium, provides adequate time is given. Figures 6.11 to 6.12 show that the random walk component fades away only when there have sufficient lags. This suggest PPP may be established in the long run.

6.8.5 Conclusion

We have examined the size of random walk in the nominal and real effective exchange rate. The core of this section is that macroeconomic time series are usually composed of random walk (permanent) and temporary components. If a series is mainly driven by the random walk component, deviation from the long run is permanent, whilst temporary shock will eventually move to mean-reverting. Applying Cochrane's variance test confirms the idea that exchange rates (both nominal and real) comprise of these two components. The influence of the random walk component is strong in the earlier lags, ranging from 8 to 17 quarters to the half size of the series which are subject to the choice of data construction. The persistent effect is less than some developed countries. This can be explained by the devaluation policy of Indonesian government in the eighties. Devaluation reduces the price of "overvalued" rupiah. As the government undertakes its financial and trade reforms in the mid-eighties, devaluation-cum-monetary policies reduce the shock from exchange rate fluctuation, attracting foreign investment and encouraging its export-led economic growth. Therefore, the price of rupiahs is much more sensitive to the changes of major exchange rates because Indonesia has exposed to the international market. A prudent and appropriate exchange rate policy is to be carried out in order to minimize the effects of internal and external shocks.

6.9 Concluding Remarks

This chapter is to analyze the movement of exchange rates and prices. The central idea of these two series is well documented in the hypothesis of Purchasing Power Parity (PPP). The concept behind PPP is to assume that there have symmetric adjustment of both nominal exchange rate and relative prices so that real exchange rate will be unaffected. The stability of real exchange rate is crucial for trade and investment. Recent literature has drawn a lot of debate on the validity of PPP. The support of PPP is usually coincided with substantial monetary shock and high variability of inflation rates, so that there is a large price differential moments between domestic and foreign countries. There are three approaches to analyze the concept of PPP. They are the neutral money approach, the Law of One Price and the Arbitrage Approach and the Efficient Market Approach. Recent research on the validity of PPP is based on the integration and cointegration statistical techniques. Most of the macroeconomic time series are non-stationary and hence applying OLS will cause inaccurate statistical inference. Since PPP is a long run concept that movement of exchange rate and prices do not drift away without bound. The application of cointegration technique can give an understanding of the long run PPP.

Indonesia has experienced high inflation as well as currency devaluation in the last two decade. The variability of inflation rate and exchange rates is detrimental to its economic growth. Understanding the movement of exchange rate and price can render the authorities to implement appropriate fiscal, monetary, financial and exchange rate policies. Hence it is better to develop multilateral exchange rate model for investigation. We construct the effective exchange rates and prices for testing PPP.

The empirical result of PPP is positive. Using Johansen's ML procedure provides a more powerful alternative test for multivariate cointegration. Only the unrestricted equation do we find cointegrating vector. The tests also find support to some papers, which state that *a priori* restriction on testing PPP can cause the failure in supporting cointegration.

Traditional view tells that the rejection of the null hypothesis of symmetry and proportionality signifies the invalidity of PPP. In order to reinforce the validity of PPP, we test the proportionality and symmetry restrictions on the equations. Three approach are used, namely, White's HCSEs 't' test; Johansen's restricted test and the restricted cointegration test developed by Liu and Maddala. The results show no rejection of the null hypothesis which prove stronger evidence of symmetry and proportionality properties of PPP.

It is known that macroeconomic time series can be decomposed into difference-stationary and trend-stationary processes. The stochastic process implies that random shock have permanent effect on the system. However, Perron argues that most of the time series are not characterized by the presence of unit root and that fluctuations are indeed transitory. He suggests that by allowing one time single change necessary to test whether there is any structural break in the nominal and real effective exchange rates. The empirical results show that we cannot reject the unit root hypothesis even though Perron's break point procedure is employed.

It is true that the presence of unit root is strong in the real and nominal effective exchange rates, the next step is to analyze the persistence and the size of random walk. Using Cochrane's variance ratio test, we find that the influence of the random walk component is strong in the earlier lags, ranging from 8 to 17 quarters to half size of the series. However, the persistence is not as strong as the developed countries which some researchers suggest.

On the whole, we find that it is in favour of PPP in Indonesia by modelling effective exchange rates and relative prices. On the other hand, it is true that the effective exchange rates are non-stationary, driven by random walk component that is very persistence. As the Indonesian government implemented its financial and trade reforms in the mid-eighties, devaluation-cum-monetary policies are to be implemented to reduce any shock from exchange rate fluctuation, to attract foreign investment, and to encourage its export-led economic growth. The price of rupiah is much more sensitive to the changes of major exchange rates because Indonesia has exposed to the international market. A prudent and appropriate exchange rate policy is to be carried out in order to minimize the effects of any shock and to keep domestic exchange rate and price from drifting apart.

Notes

1. The exporting countries are US, Canada, Australia, Japan, Austria, Belgium-Luxemberg, Finland, France, Germany, Italy Netherlands, Spain, Sweden, Switzerland, UK, Hong Kong, India, Korea, Malaysia, Philippines, Singapore, Thailand Iraq, Saudi Arabia, China.

2. For arithmetic weighted averaging, $X = S^{n}_{i-1} w_i Y_i$, and $X = a(Y_i)^{wi}$ if geometric weighted averaging is used. Officer (1980) argues that using geometric weighted averaging is preferred since it has the properties of reversibility and symmetry.

3. In Bahmani-Oskooee's (1993a) paper, he defines PPP as:

$$P_i = R_{ij} \bullet P_j$$

where R_{ij} is the value of i's currency per j's currency; and P_i and P_j are the price level of countries i and j.

For the arithmetic averaging, the above equation will be:

$$P_i = \sum_{j=1}^{n} W_{ij} R_{ij} \bullet P_j$$

where W_{ij} is the weight to country j and the sum of W_{ij} is 1. Taking log and add an intercept and coefficients, the equation will be like Eq. 6.15.

For the geometric averaging, the equation $[P_i = R_{ij} \times P_j]$ will be:

$$P_i = \pi [R_{ij} \; x \; P_j]^{W_{ij}}$$

Taking log and add an intercept and coefficients, the equation will be like Eq. 6.17 where P_F is:

$$P_F = \pi [R_{ij} \; x \; P_j]^{W_{ij}}$$

P_i and P_F are identical to IP and PGW respectively in our chapter. It states that PPP holds if $d_1 = 1$, showing that in the long run, domestic inflation rate will be the same as foreign inflation rate adjusted for the movement in i's trading partners' exchange rate.

4. We use IPPRA stands for (IP-PRA); IPPRG for (IP-PRG); NAWIP for (NAW-IP); NGWIP for (NGW-IP); NAWPRA for (NAW+PRA) and NGWPRG for (NGW+PRG).

5. Schwert uses Monte Carlo method to estimate the number of lags with is not sensitive to the strength of the moving average component. The formula he constructs is: $l_4 = \text{Int}\{4(T/100)^{1/4}\}$, where T is the sample size.

6. We also test stationarity of real effective exchange rate, namely, REA (arithmetic) and REG (geometric), even though they are not directly tested by cointegration in either unrestricted and restricted equations. These two series, however, will be used in the following section.

7. Johansen's maximal eigenvalue statistic for testing $H(r\text{-}1)$ against $H(r)$ is given by

$$\lambda_{max} = -n \log(1\text{-}r)$$

while the trace statistic for testing $H(r)$ against $H(m)$ is given by

$$J_T = -n\, \Sigma^{m}_{i=r+1} \log(1\text{-}r)$$

8. The restricted cointegration test, as stated by Liu and Maddala, is a more direct approach. Suppose there is an equation as follows:

$$x_t = \alpha_0 + \alpha_1 y_t + \varepsilon_t$$

The null hypothesis of $[\alpha_0, \alpha_1\}]$ is [0, 1]. This is a direct test because the null hypothesis is specified in the cointegrating regression. We do not estimate any cointegrating regression. Therefore, if the error term m_t is stationary ($\varepsilon_t = x_t - y_t$), then x_t and y_t are cointegrated with a factor of one because cointegrating factor is unique. It is a 'restricted' test as it depends on the restriction $[\alpha_0, \alpha_1\}] = [0, 1]$ (p.368). For further details, see Liu and Maddala (1992).

9. Prebisch-Singer hypothesis states that the terms of trade deteriorate as changes in growth demand and market structures for primary and manufacturing products. Manufacturing goods have higher prices due to massive demand, greater monopolistic power and productivity gain; whilst there is a decline in relative price of primary products because of excess supply and a fall in the income proportion spent on primary products. In the long run, the trend of terms of trade will be against the home country. This especially happens in the less developed countries.

10. The size of a random walk will be discussed thoroughly in the next section.

11. For Model (B), Perron uses two step additive outliner model for estimation. The procedure involves two equations and such that the dependent variable of the second equation is the residual of the first.

$$y_t = \hat{\mu}^B + \hat{\beta}^B t + \hat{\gamma}^B DT_t^* + \tilde{\mu}_t \tag{1}$$

$$\tilde{\mu}_t = \hat{\alpha}^B \tilde{\mu}_{t-1} + \sum_{i=1}^{k} \hat{c}_i \Delta \tilde{\mu}_{t-i} + \hat{e}_t \tag{2}$$

12. Authors like Perron (1989), Duck (1992) obtains the maximum lags by reducing the lag length to $k=n$ where the t-statistic on the coefficient on $\Delta y_{t-(n+1)}$ was less than 1.6 while the t statistic on the coefficient on Δy_{t-n} was greater than 1.6. However, I use Schwert's (1987) method for estimating the maximum value of the lag and the value is 3. In any cases, the null is not rejected.

Table 6.1 A Summary of Surveys on the Validity of PPP Using Integration and Cointegration Techniques

Author	Sample Period / Country	Exchange Rate	Price Index	Other Variables	Technique	Support for PPP
Edison and Klovland (1987)	1870-1971(A);2 DCs	bilateral	GDP deflator	Labour productivity, Terms of trade, gov. expenditure	ADF, CRDW	yes
Taylor (1988)	1973-1985(M);5 DCs	bilateral	WPI		DF, ADF	no
Enders (1989)	1862-1913;2 DCs	bilateral	WPI		ARIMA, DF	yes
McNown and Wallace (1989)	1976-1986(Q);4 LDCs	bilateral	CPI, WPI		ADF	yes
Whitt (1989)	1973-1988(M);5 DCs	bilateral	CPI		DF, Sims	yes
Abuaf and Jorion (1990)	1973-1989(M);10 DCs	bilateral	CPI		GLS	yes
Davutyan and Pippenger (1990)	1973-1980(M);6 DCs	bilateral	CPI	includes transaction costs	SURE, CRDW, ADF	mixed
Layton and Stark (1990)	1963-1987(M)(Q);6 DCs	effective	CPI		CRDW, DF, ADF, ARVAR	little
Patel (1990)	1974-19866(Q);6 DCs	bilateral	WPI		ADF, Stock-Watson	no
McNown and Wallace (1990)	1957-1986(Q);4 DCs	bilateral	CPI, WPI		DF, ADF	mixed
Ardeni and Lubian (1991)	1957-1985(M)(A);7 DCs	bilateral	CPI, WPI		Variance Ratio, DF, ADF	yes - (A) no - (M)
Johnson (1991)	1973-1988(M);6DCs	bilateral	CPI		PP	no
Kim and Enders (1991)	1973-1987(M);3DCs, 3 LDCs	bilateral	WPI		DF, ADF, PP	no

cont'd

Author	Sample Period / Country	Exchange Rate	Price Index	Other Variables	Technique	Support for PPP
Fraser, Taylor and Webster (1991)	1975-1980(M); 35 industries	bilateral	WPI		DF, ADF	no
Lim (1992)	1974-1989(Q);10 DCs	bilateral	CPI	gov. expenditure, real foreign interest rate, productivity, interest differential, terms of trade	ADF, Johansen, Stock-Watson	no
Phylaktis (1992)	1923-1925(M);3 DCs	bilateral	WPI		DF, ADF, Johansen	yes
Bahmani-Oskooee (1993a)	1973-1988(Q);25 LDCs	effective	CPI		ADF	no
Cheung and Lai (1993)	1974-1986(M);5 DCs	bilateral	CPI, WPI		ADF, PP, Johansen	depends on the tests
Chowdhury and Sdogati (1993)	1972-1990(M);4 DCs	bilateral	CPI		ADF,	mostly rejected
Conejo and Shields (1993)	1949-1990;5 LDCs	bilateral	CPI, WPI		DF, ADF	mixed
Flynn and Boucher (1993)	1957-1987(M);2 DCs	bilateral	CPI		ADF, CRDW, Perron	no
Kugler and lenz (1993)	1973-1990(M);15 DCs	bilateral	CPI		Johansen	mixed

cont'd

Author	Sample Period / Country	Exchange Rate	Price Index	Other Variables	Technique	Support for PPP
Pippenger (1993)	1973-1988(M);12 DCs	bilateral	WPI		DF, ADF	yes
Phylaktis and Kassimatis (1994)	1974-1987(M); 8 Pacific Basin countries	bilateral (black market)	CPI, WPI		GLS, Johansen	yes
Lippert and Breuer (1994)	1974-1991(Q);2 DCs	bilateral	CPI	productivity, technology, taxes, taste	ADF	mixed but improve
Mahdavi and Zhou (1994)	1973-1991(Q);13 high inflation countries	bilateral	CPI, WPI		ADF, Johansen	mixed
Moosa (1994)	1900-1987(A);4 DCs	bilateral	CPI, WPI		DF, ADF, Johansen	yes

note: DF: Dickey Fuller test; ADF: augmented Dickey Fuller test; PP: Phillips Perron test; CRDW: cointegrating regression Durbin Watson test;
GLS: general least square.
DCs: developed countries; LDCs: less developed countries
(A): annual data; (Q): quarterly data; (M): monthly data

Table 6.2 Unit Root Tests (Level)

	Dickey-Fuller	Augmented Dickey-Fuller	Phillips-Perron
PAW	-2.3454	-1.5642	-2.3781
PGW	-0.8251	-1.5920	-1.0899
IP	-2.1547	-4.0756*	-2.1601
PRA	-1.0960	-1.9349	-1.1929
PRG	-0.8924	-0.8343	-0.9537
NAW	-2.4076	-1.7218	-2.4406
NGW	-1.9344	-1.1602	-1.8695
REA	-2.4061	-1.2795	-2.4012
REG	-1.7348	-1.4101	-1.8380

The critical value of 5% and 10% significance level are -3.48 and -3.13 respectively. (MacKinnon, 1990)
"*" significant at 5% level.

Table 6.3 **Unit Root Tests (First Difference)**

	Dickey-Fuller	Augmented Dickey-Fuller	Phillips-Perron
PAW	-8.5956*	-4.4279*	-8.5898*
PGW	-7.8979*	-3.4526*	-7.8734*
IP	-6.5671*	-3.4414**	-6.4983*
PRA	-7.7589*	-3.6498*	-7.7653*
PRG	-8.0460*	-3.8446*	-8.0537*
NAW	-8.0236*	-4.7003*	-8.0602*
NGW	-7.9615*	-4.1895*	-8.0198*
REA	-8.1516*	-4.7459*	-8.2074*
REG	-7.6998*	-4.2667*	-7.7024*

The critical value of 5% and 10% significance level are -3.48 and -3.13 respectively. (MacKinnon, 1990)
"*" and "**" significant at 5% and 10% level.

Table 6.4 Cointegration Tests (DF, ADF & PP)

	DF	ADF	PP
Method 1			
NAW IP PRA	-2.8251	-2.4188	-2.9435
NGW IP PRG	-2.4382	-2.1260	-2.5125
Method 2			
NAW IPPRA	-2.6508	-2.0085	-2.7505
NGW IPPRG	-2.0445	-1.3202	-2.0993
Method 3			
NAWIP PRA	-2.3165	-2.0881	-2.3895
NGWIP PRG	-2.4379	-2.0032	-2.5072
Method 4			
NAWPRA IP	-2.2457	-1.6383	-2.3112
NGWPRG IP	-1.4167	-1.3951	-1.5065
Method 5			
IP PAW	-2.0771	-3.0984	-2.1106
PAW IP	-2.4016	-1.7417	-2.4070
IP PGW	-1.9711	-2.5734	-2.0683
PGW IP	-0.9425	-1.5857	-1.0414

For method 1, the critical value of DF test at 5% and 10% significance level are -4.31 and -3.84 respectively.
the critical value of ADF test at 5% and 10% significance level are -4.32 and -3.84 respectively.

For methods 2-5, the critical value of DF test at 5% and 10% significance level are -3.93 and -3.50 respectively.
the critical value of ADF test at 5% and 10% significance level are -3.94 and -3.50 respectively.

Table 6.5 LR Test Based on Maximal Eigenvalue of the Stochastic Matrix

Variable	Null	Alternative	Maximal Eigenvalue Statistic
NAW IP PRA	$r = 0$	$r = 1$	16.6857
	$r \leq 1$	$r = 2$	7.4038
	$r \leq 2$	$r = 3$	2.7853
NGW IP PRG	$r = 0$	$r = 1$	18.8759
	$r \leq 1$	$r = 2$	4.8376
	$r \leq 2$	$r = 3$	2.7444
NAW IPPRA	$r = 0$	$r = 1$	5.1748
	$r \leq 1$	$r = 2$	1.3389
NGW IPPRG	$r = 0$	$r = 1$	4.7812
	$r \leq 1$	$r = 2$	1.2814
NAWIP PRA	$r = 0$	$r = 1$	9.1609
	$r \leq 1$	$r = 2$	4.8907
NGWIP PRG	$r = 0$	$r = 1$	4.7766
	$r \leq 1$	$r = 2$	3.3739
NAWPRA IP	$r = 0$	$r = 1$	13.5811
	$r \leq 1$	$r = 2$	4.3753
NGWPRG IP	$r = 0$	$r = 1$	13.3234
	$r \leq 1$	$r = 2$	2.0759
PAW IP	$r = 0$	$r = 1$	12.8434
	$r \leq 1$	$r = 2$	4.1937
PGW IP	$r = 0$	$r = 1$	15.4040
	$r \leq 1$	$r = 2$	2.3465

Note: A small sample correction has been investigated by Reimers (1992) for calculating the test statistic for contegrating rank. The critical value is based on the likelihood-based inference simulated by Johansen (1995).

Table 6.6 Cointegration LR Test Based on Trace of the Stochastic Matrix

Variable	Null	Alternative	Trace Statistic
NAW IP PRA	$r = 0$	$r \geq 1$	26.8749*
	$r \leq 1$	$r \geq 2$	10.1892
	$r \leq 2$	$r = 3$	2.7853
NGW IP PRG	$r = 0$	$r \geq 1$	26.4579
	$r \leq 1$	$r \geq 2$	7.5820
	$r \leq 2$	$r = 3$	2.7444
NAW IPPRA	$r = 0$	$r \geq 1$	6.5137
	$r \leq 1$	$r = 2$	1.3389
NGW IPPRG	$r = 0$	$r \geq 1$	6.0626
	$r \leq 1$	$r = 2$	1.2814
NAWIP PRA	$r = 0$	$r \geq 1$	14.0517
	$r \leq 1$	$r = 2$	4.8907
NGWIP PRG	$r = 0$	$r \geq 1$	8.1505
	$r \leq 1$	$r = 2$	3.3739
NAWPRA IP	$r = 0$	$r \geq 1$	17.9565
	$r \leq 1$	$r = 2$	4.3753
NGWPRG IP	$r = 0$	$r \geq 1$	15.3993
	$r \leq 1$	$r = 2$	2.0759
PAW IP	$r = 0$	$r \geq 1$	17.0371
	$r \leq 1$	$r = 2$	4.1937
PGW IP	$r = 0$	$r \geq 1$	17.7504
	$r \leq 1$	$r = 2$	2.3465

Note: A small sample correction has been investigated by Reimers (1992) for calculating the test statistic for contegrating rank. The critical value is based on the likelihood-based inference simulated by Johansen (1995). * represents 10% significant level.

Table 6.7 Estimated Cointegrating Vector (β) and Adjustment matrix (α) (Normalized Values)

1978Q4 - 1993Q4	(61 Observations)	VAR=3, r=1
Variable	β	α
NAW	-1.0000	-0.2957
IP	4.1870	-0.0125
PRA	-3.3823	-0.0071

Table 6.8 Log-likelihood Ratio Statistic for Testing the Diagonality of the Error Covariance Matrix

System Log-likelihood = 576.1885

Equation on Log-likelihood (ΔNAW) = 124.6493

Equation on Log-likelihood (ΔIP) = 216.7877

Equation on Log-likelihood (ΔPRA) = 233.7098

Log-likelihood ratio statistic LR: $\chi^2(3)$ = 2.0834

Table 6.9 Estimation of Error Correction Models

Dependent Variable	ECM	Diagnostic Test	
ΔNAW (α_{10})	-0.01403	Serial Correction	$\chi^2(4) = 5.2775$ [0.265]
	(-0.03900)	Functional Form	$\chi^2(1) = 8.5775$ [0.003]*
	[0.969]	Normality	$\chi^2(2) = 12.498$ [0.000]*
		Heteroscedasticity	$\chi^2(1) = 11.141$ [0.001]*
ΔIP (α_{20})	-0.57869	Serial Correction	$\chi^2(4) = 11.032$ [0.026]*
	(-0.40304)	Functional Form	$\chi^2(1) = 0.0765$ [0.782]
	[0.689]	Normality	$\chi^2(2) = 9.1743$ [0.010]*
		Heteroscedasticity	$\chi^2(1) = 1.1414$ [0.285]
ΔPRA (α_{30})	-0.3716	Serial Correction	$\chi^2(4) = 0.4127$ [0.981]
	(-2.2590)	Functional Form	$\chi^2(1) = 0.00002$ [0.999]
	[0.028]*	Normality	$\chi^2(2) = 5.2962$ [0.072]
		Heteroscedasticity	$\chi^2(1) = 1.2486$ [0.264]

Note: α_{10}, α_{20}, α_{30} are the coefficients of the ECM in equations 6.42, 6.43, and 6.44 respectively.
(•) and [•] are t-ratios and P-values.
* indicates significance at the 5 percent level.

Table 6.10 Testing Symmetry and Proportionality

	H_0	Adjusted "t" statistics	Johansen restricted test	Restricted cointegration test		
				DF	ADF	PP
Unrestricted Equations						
NAW IP PRA	H1		0.0317(1)			
	H2		1.2181(2)	-2.1269	-1.5736	-2.1821
	H3	-0.9427				
	H4	-1.2667				
NGW IP PRG	H1		0.0592(1)			
	H2		0.6495(2)	-1.2904	-1.0216	-1.3456
	H3	-2.4585*				
	H4	-0.9495				
Restricted Equations						
NAWIP PRA	H3	1.5571				
	H4	-7.4994*				
	H5		0.5353(1)	-2.3384	-2.6444	-2.4273
NAWPRA IP	H3	16.6691*				
	H4	11.9143*				
	H5		0.2946(1)	-2.1269	-1.5736	-2.1821
NGWPRG IP	H3	3.1865*				
	H4	11.6691*				
	H5		0.0023(1)	-1.2904	-1.0216	-1.3456
PAW IP	H3	16.3505*				
	H4	14.5313*				
	H5		1.6569(1)	-2.1235	-1.7615	-2.1800
PGW IP	H3	-2.1802*				
	H4	13.3076*				
	H5		4.4069(1)*	-0.9355	-1.8284	-1.1823

The unrestricted equation is $s_t = \alpha_0 + \alpha_1 p_t + \alpha_2 p$ whereas the restricted equation is $s_t = \beta_0 + \beta_1 Z_t$.

The null hypothesis against the alternative is:

H1: $\alpha_1 = -\alpha_2$
H2: $\alpha_0 = 0, \alpha_1 = 1, -\alpha_2 = -1$
H3: $(\alpha_0); \beta_0 = 0$
H4: $(\alpha_1); \beta_1 = 1$
H5: $\beta_0 = 0, \beta_1 = 1$

The 5% & 10% critical values for DF, ADF, PP are -3.48 and -3.13; (·) represents χ^2 with number of degree of freedom.
"*" Indicates statistical significance at 5% level.

Table 6.11 Descriptive Statistics of Effective Exchange Rates (1983Q2 as the Break)

Sample: 1978Q1 - 1983Q1				
	Maximum	Minimum	Mean	St. Error
REA	2.6486	2.4501	2.5835	0.0574
REG	2.0097	1.7413	1.8684	0.0840
NAW	2.4686	2.2309	2.4013	0.0712
NGW	1.9007	1.5453	1.7231	0.0976
Sample: 1983Q2 - 1993Q4				
REA	2.9033	2.7284	2.8311	0.0614
REG	2.2749	2.0056	2.1694	0.0713
NAW	2.9437	2.6084	2.8030	0.1163
NGW	2.2787	2.0050	2.1724	0.0862

Table 6.12 Descriptive Statistics of Effective Exchange Rates (1986Q3 as the Break)

Sample: 1978Q1 - 1986Q2				
	Maximum	Minimum	Mean	St. Error
REA	2.7604	2.4501	2.6446	0.0909
REG	2.1612	1.7413	1.9548	0.1339
NAW	2.6648	2.2309	2.4928	0.1309
NGW	2.1049	1.5453	1.8490	0.1807
Sample: 1986Q3 - 1993Q4				
REA	2.9033	2.8218	2.8691	0.0214
REG	2.2749	2.0883	2.2019	0.0486
NAW	2.9437	2.7861	2.8733	0.0500
NGW	2.9437	2.7861	2.8733	0.0500

Table 6.13 Perron Tests of the Unit Root Hypothesis of Structural Break at 1983:2 ($\lambda = 0.33$)

Variable	Model	t_α (k=1)	t_α (k=2)	t_α (k=3)	t_α (k=4)
REA	A	-3.3484	-3.2497	-1.9502	-1.8918
	B	-2.7173	-2.3870	-2.2416	-2.2403
	C	-3.3107	-3.2616	-1.2072	-1.0097
REG	A	-1.9662	-1.7513	-1.5545	-1.3860
	B	-0.2454	-2.2495	-2.8107	-2.5208
	C	-2.2732	-1.9562	-1.7934	-1.4676
NAW	A	-3.3493	-3.2599	-2.3990	-2.1979
	B	-2.7181	-2.4251	-2.3788	-2.1505
	C	-3.3183	-3.3626	-1.6744	-1.4867
NGW	A	-2.3066	-1.9111	-1.1567	-1.2843
	B	-2.6178	-2.1211	-2.6065	-2.5042
	C	-2.3719	-2.3199	-1.7863	-1.7373

t_α is the t statistic of the null hypothesis that $\alpha = 1$. k is the number of lags.
The critical values for $\lambda = 0.33$ are as follows:
Model (A): -4.39(1%), -3.76(5%), -3.46(10%);
Model (B): -4.51(1%), -3.87(5%), -3.58(10%); and
Model (C): -4.78(1%), -4.17(5%), -3.87(10%)(see Perron 1989).

Table 6.14 **Perron Tests of the Unit Root Hypothesis of Structural Break at 1986:3 ($\lambda = 0.53$)**

variable	Model	t_α(k=1)	t_α (k=2)	t_α (k=3)	t_α (k=4)
REA	A	-2.4386	-2.2384	-0.6588	-0.6114
	B	-3.4523	-3.1338	-3.1656	-3.2458
	C	-3.7799	-3.6097	-2.5564	-2.6213
REG	A	-1.7423	-1.5171	-1.2491	-1.1570
	B	-3.0060	-2.8453	-3.4520	-3.2656
	C	-3.0505	-2.8221	-3.1529	-3.0044
NAW	A	-2.5762	-2.4546	-1.3264	-1.1336
	B	-3.2831	-2.3916	-3.1561	-2.9177
	C	-3.6335	-3.4814	-2.7883	-2.5720
NGW	A	-1.9230	-1.5533	-1.0908	-1.1288
	B	-0.3377	-2.8787	-3.3649	-3.4270
	C	-3.3173	-2.8511	-3.1307	-3.2141

t_α is the t statistic of the null hypothesis that $\alpha = 1$. k is the number of lags.
The critical values for $\lambda = 0.53$ are as follows:
Model (A): -4.32(1%), -3.76(5%), -3.46(10%);
Model (B): -4.56(1%), -3.96(5%), -3.68(10%); and
Model (C): -4.90(1%), -4.24(5%), -3.96(10%) (see Perron 1989).

Table 6.15 **Summary Statistics for the Change of Nominal and Real Effective Exchange Rates (1978Q2 - 1993Q4) Sample Size: 63**

	ΔGNAW	ΔGNGW	ΔGREA	ΔGREG
Maximum	0.18610	0.17880	0.17230	0.18320
Minimum	-0.07590	-0.09630	-0.14430	-0.04900
Means	0.01050	0.01080	0.00551	0.00588
St. Deviation	0.03878	0.04668	0.04980	0.03640
Skewness	2.70607	1.68532	1.04670	3.42486
Excess Kurtosis	9.53273	4.19931	4.94588	12.7472
Normality Chi^2 (2)	84.947**	21.084**	25.064**	244.44**

** represents 5% statistical significance.

Table 6.16 Variance Ratio Test on the Nominal Effective Exchange Rate (1978Q1 - 1993Q4)

	NAW	NGW
1	1.00000 (0.14548)	1.00000 (0.14548)
2	0.99863 (0.20711)	1.00656 (0.20875)
3	0.90770 (0.23244)	0.89303 (0.22868)
4	0.81128 (0.24188)	0.80870 (0.24111)
5	0.72541 (0.24384)	0.77864 (0.26174)
6	0.64309 (0.23884)	0.79468 (0.29513)
7	0.86329 (0.23603)	0.77499 (0.31360)
8	0.51865 (0.22636)	0.73271 (0.31978)
9	0.45333 (0.21175)	0.69105 (0.32279)
10	0.41977 (0.20859)	0.64692 (0.32145)
11	0.41460 (0.21810)	0.62814 (0.33043)
12	0.39137 (0.21710)	0.58891 (0.32667)
13	0.37259 (0.21721)	0.53600 (0.31248)
14	0.38211 (0.23347)	0.53578 (0.32737)
15	0.37026 (0.23655)	0.52436 (0.33500)
16	0.35770 (0.23847)	0.52203 (0.34802)
17	0.32177 (0.22346)	0.48437 (0.33637)
18	0.28199 (0.20368)	0.44353 (0.32037)
19	0.27772 (0.20838)	0.45621 (0.34230)
20	0.26677 (0.20768)	0.46044 (0.35845)
21	0.27343 (0.22064)	0.48057 (0.38780)
22	0.27094 (0.22643)	0.48540 (0.40565)
23	0.27130 (0.23463)	0.48326 (0.41795)
24	0.28266 (0.25282)	0.48959 (0.43790)
25	0.28642 (0.26479)	0.48245 (0.44603)
26	0.28929 (0.27631)	0.47044 (0.44934)
27	0.27222 (0.26851)	0.43710 (0.43115)
28	0.23935 (0.24374)	0.39743 (0.40472)
29	0.20313 (0.21350)	0.37752 (0.39680)
30	0.15563 (0.16881)	0.33771 (0.36629)

Note: The standard error (in parentheses) of the variance ratios (σ_k^2/σ_t^2) are computed as $(4k/3T)^{1/2} * d_k^2/d_1^2$, where k is the number of lags; T is the total observations minus k; and d_k^2/d_1^2 are the estimates for σ_k^2 and σ_t^2 respectively.

Table 6.17 Variance Ratio Test on Real Effective Exchange Rate (1978Q1 - 1993Q4)

	REA	REG
1	1.00000 (0.14548)	1.00000 (0.14548)
2	0.98921 (0.20215)	1.04222 (0.21615)
3	0.89888 (0.23018)	1.00521 (0.25741)
4	0.76744 (0.22881)	0.95463 (0.28462)
5	0.67950 (0.22841)	0.88188 (0.29644)
6	0.60400 (0.22432)	0.85211 (0.31647)
7	0.55242 (0.22354)	0.81741 (0.33077)
8	0.49405 (0.21562)	0.77219 (0.33701)
9	0.44371 (0.20726)	0.73332 (0.34253)
10	0.42250 (0.20994)	0.68766 (0.34170)
11	0.39724 (0.20897)	0.63971 (0.33652)
12	0.35431 (0.19654)	0.57877 (0.32105)
13	0.32148 (0.18741)	0.48681 (0.28380)
14	0.32922 (0.20116)	0.44735 (0.27334)
15	0.32207 (0.20577)	0.41043 (0.26221)
16	0.31186 (0.20791)	0.38317 (0.25544)
17	0.29357 (0.20387)	0.36578 (0.25402)
18	0.27393 (0.19787)	0.34822 (0.25153)
19	0.29646 (0.22244)	0.38027 (0.28532)
20	0.31492 (0.24516)	0.40920 (0.31856)
21	0.32674 (0.26366)	0.41338 (0.33358)
22	0.32170 (0.26885)	0.40534 (0.33875)
23	0.32181 (0.27832)	0.39141 (0.33851)
24	0.31990 (0.28613)	0.37560 (0.33595)
25	0.31670 (0.29279)	0.38806 (0.35876)
26	0.30887 (0.29502)	0.38792 (0.37223)
27	0.27679 (0.27302)	0.36157 (0.35665)
28	0.24103 (0.24545)	0.33117 (0.33725)
29	0.20508 (0.21555)	0.30127 (0.31666)
30	0.14956 (0.16222)	0.25416 (0.27567)

Note: see Table 6.16

Figure 6.1 Changes in Nominal Effective Exchange Rate (DNAW) and Domestic Price (DIP)

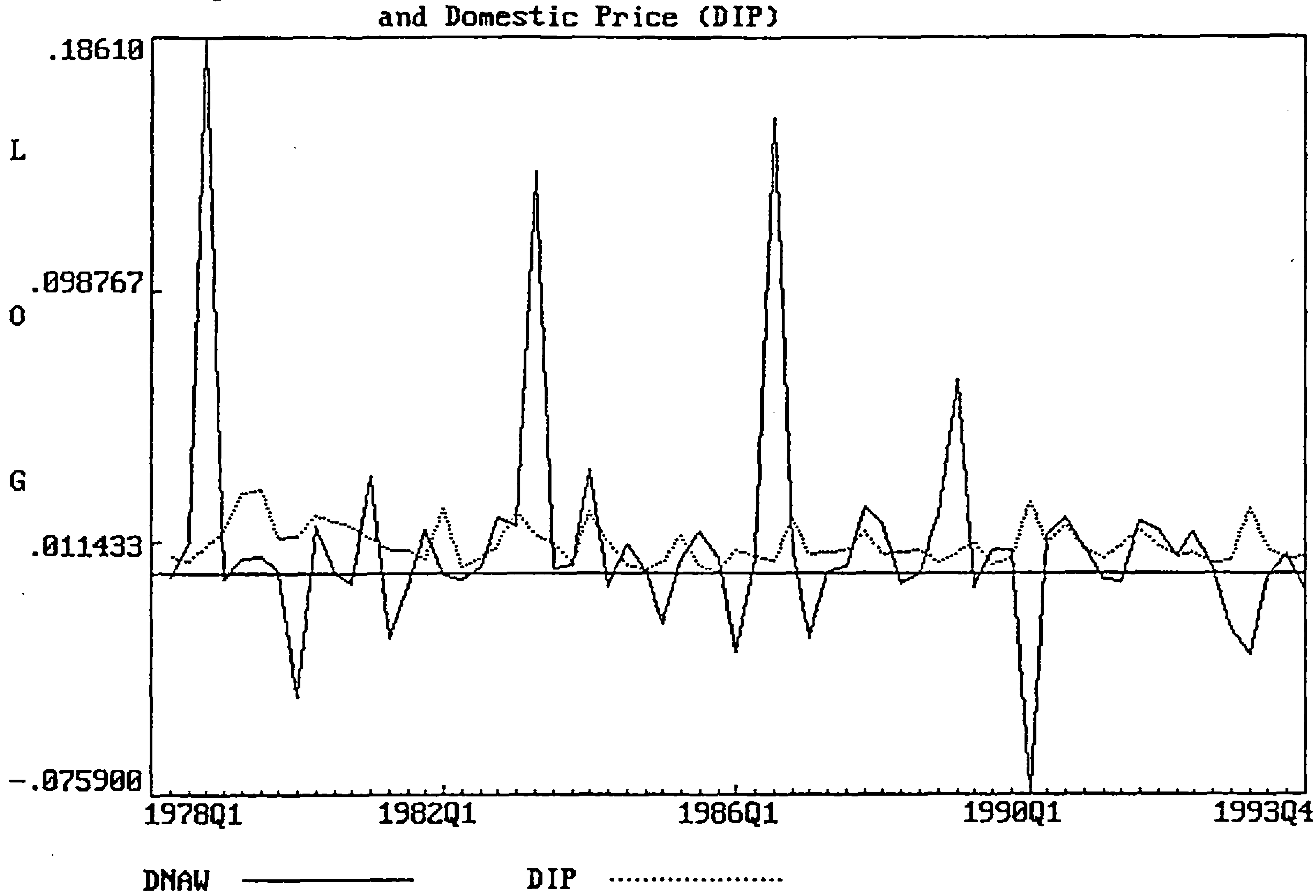


Figure 6.2 Changes in Nominal Effective Exchange Rate (DNAW) and Effective Foreign Price (DPRA)

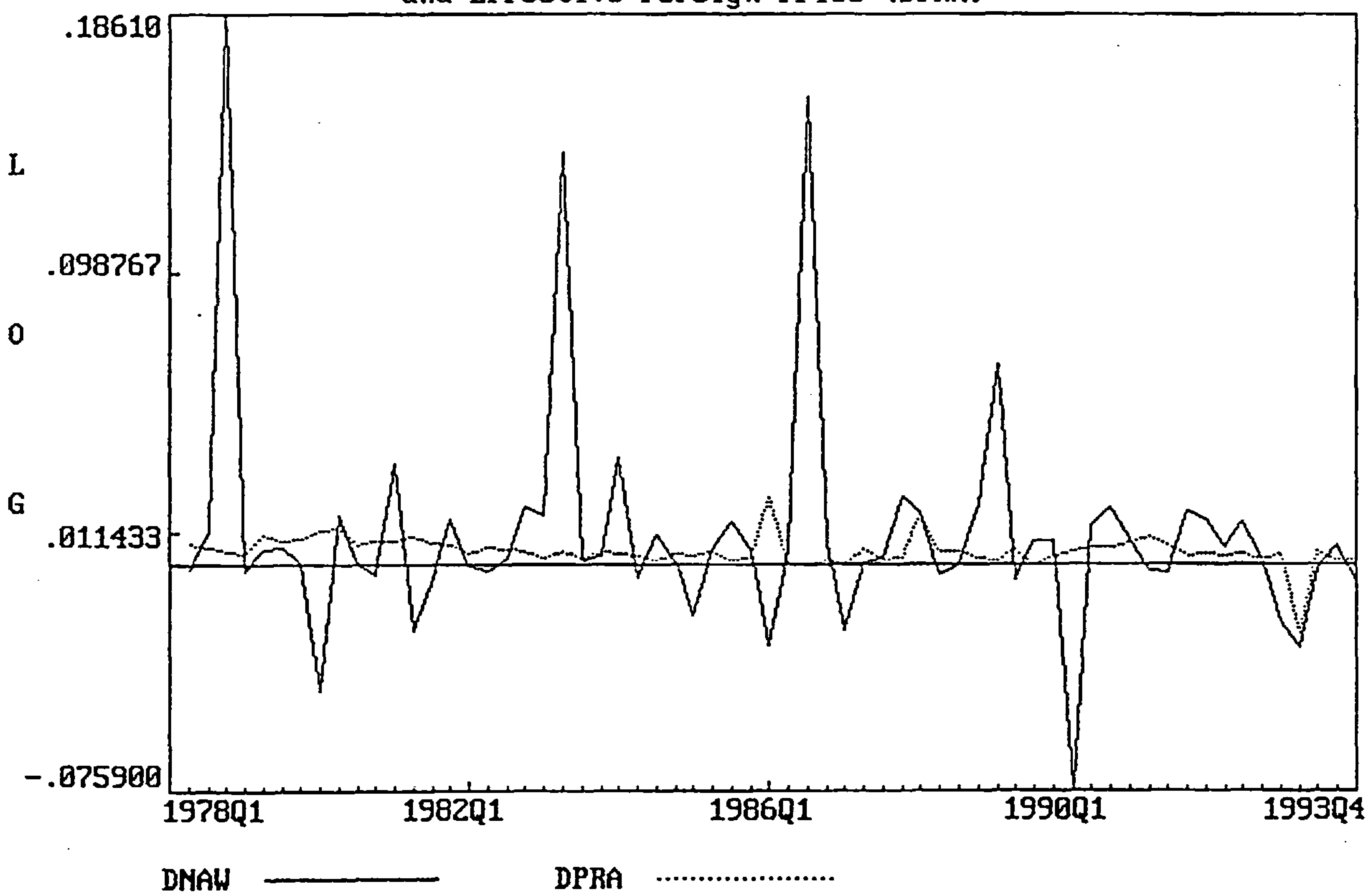


Figure 6.3 Changes in Domestic Price (DIP) and Effective Foreign Price (DPRA)

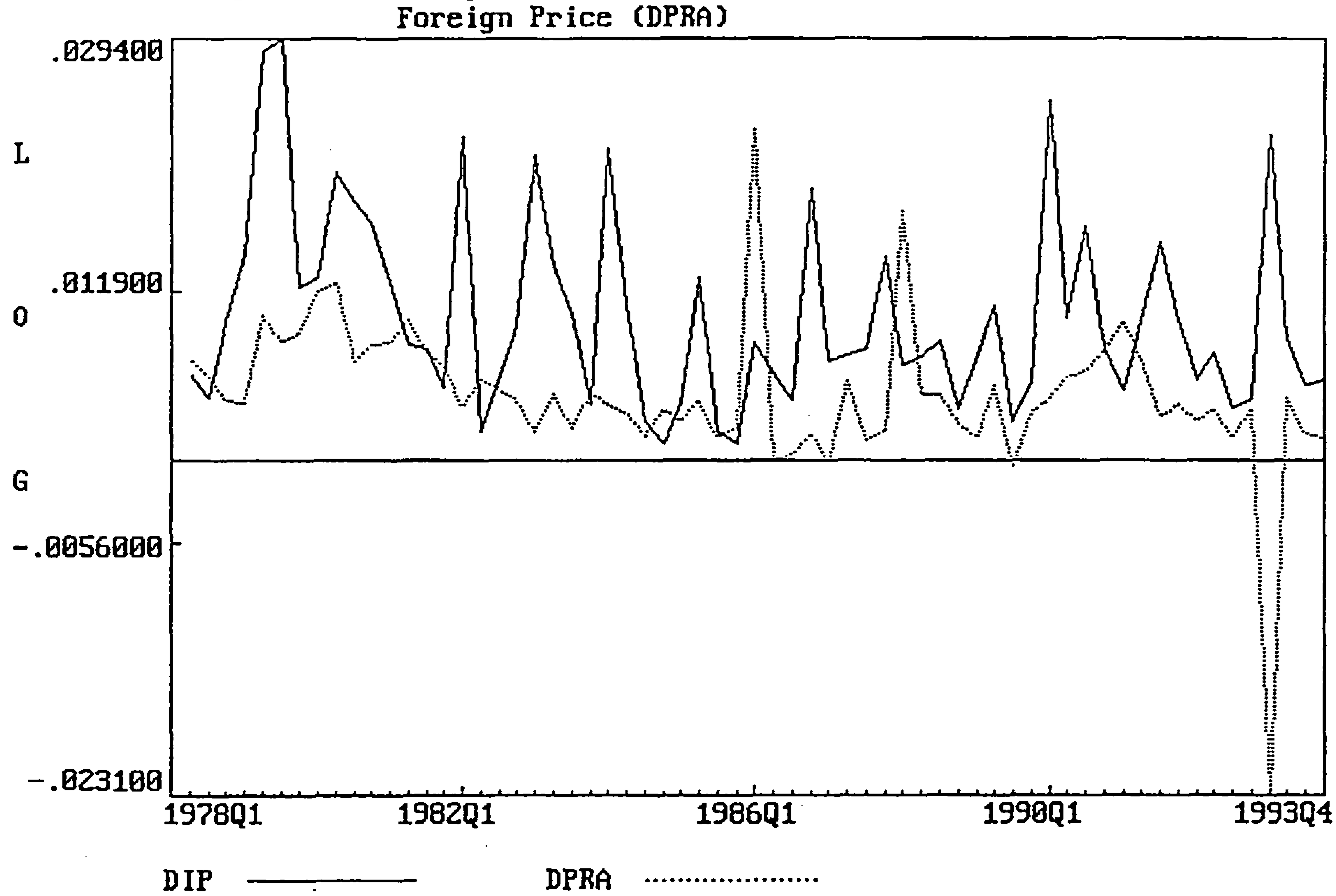


Figure 6.4 Ratio of Domestic Price (IP) to Effective Foreign Price (PRA)

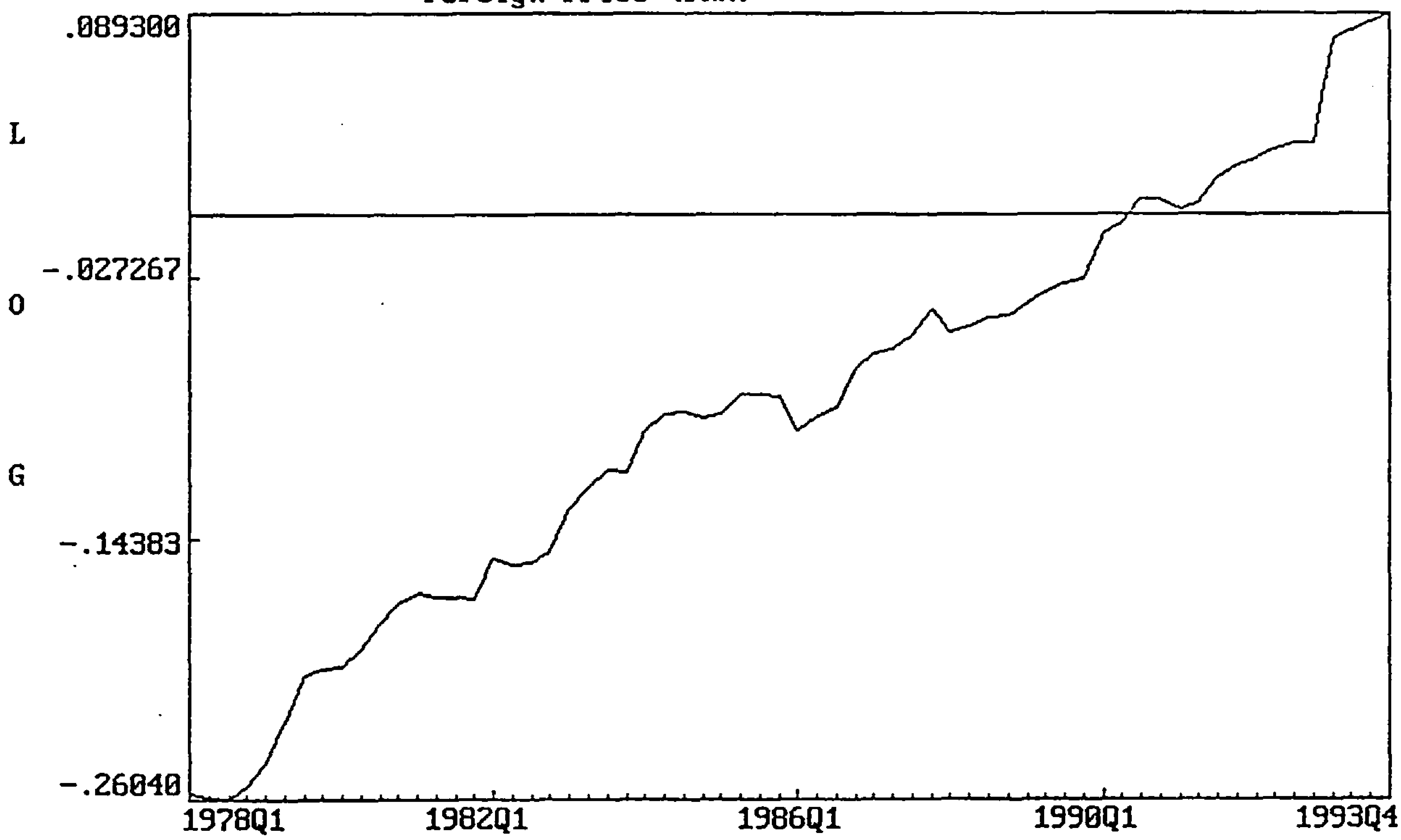


Figure 6.5 Nominal Effective Exchange Rates (NAW, NGW)

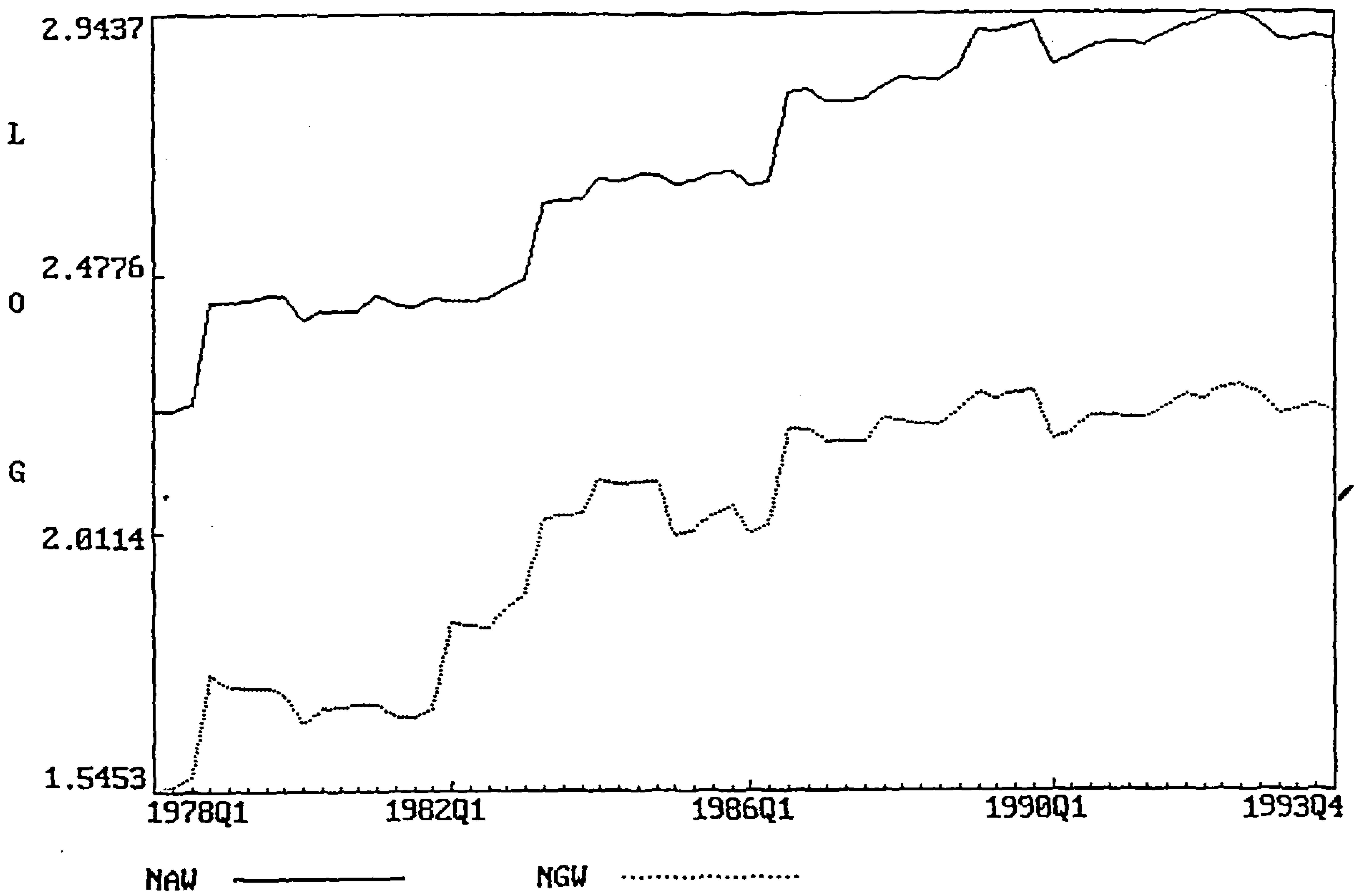


Figure 6.6 Real Effective Exchange Rates (REA, REG)

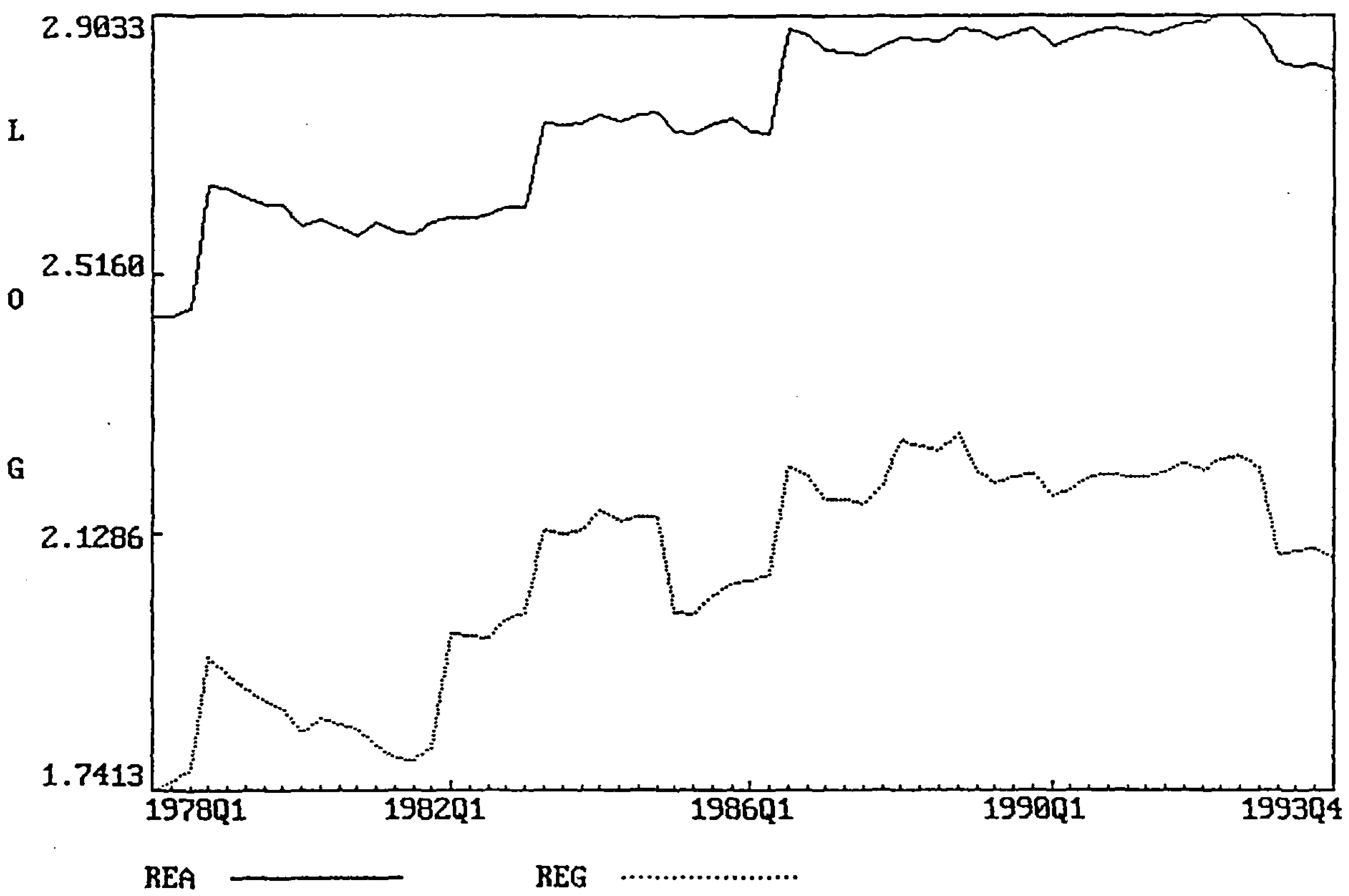


Figure 6.7 Variance of k-differences (NAW)

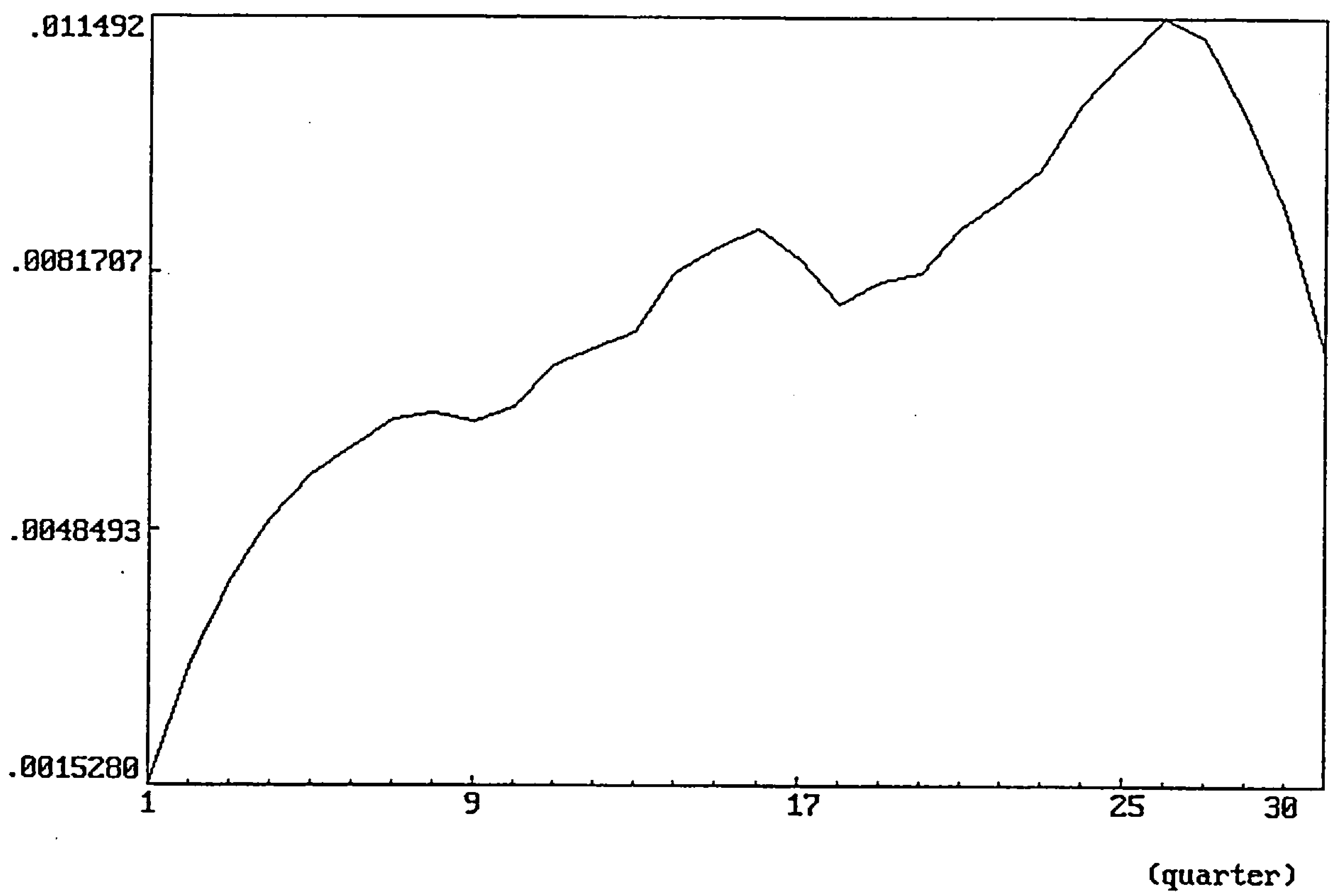


Figure 6.8 Variance of k-differences (NGW)

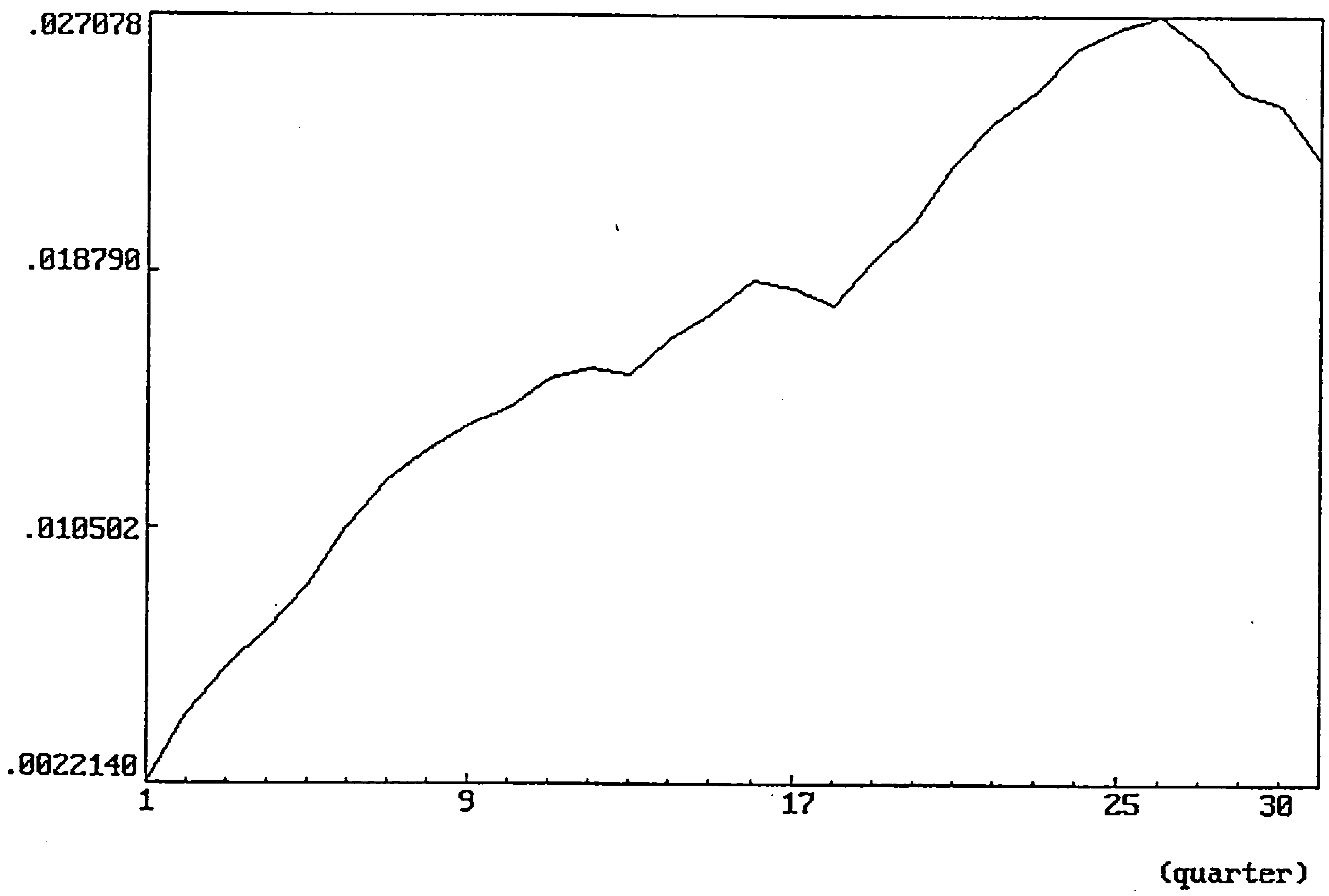


Figure 6.9 Variance of k-differences (REA)

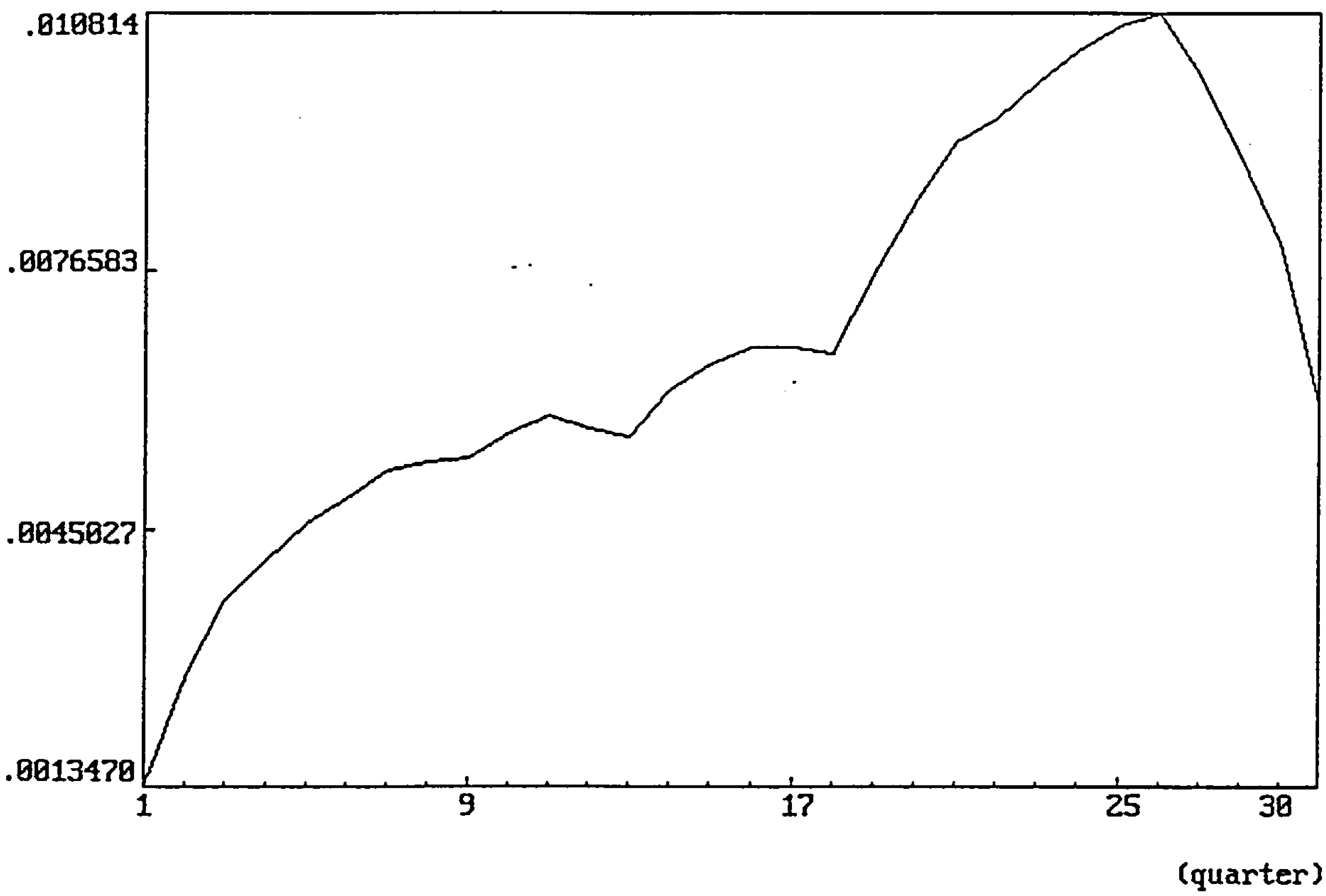


Figure 6.10 Variance of k-differences (REG)

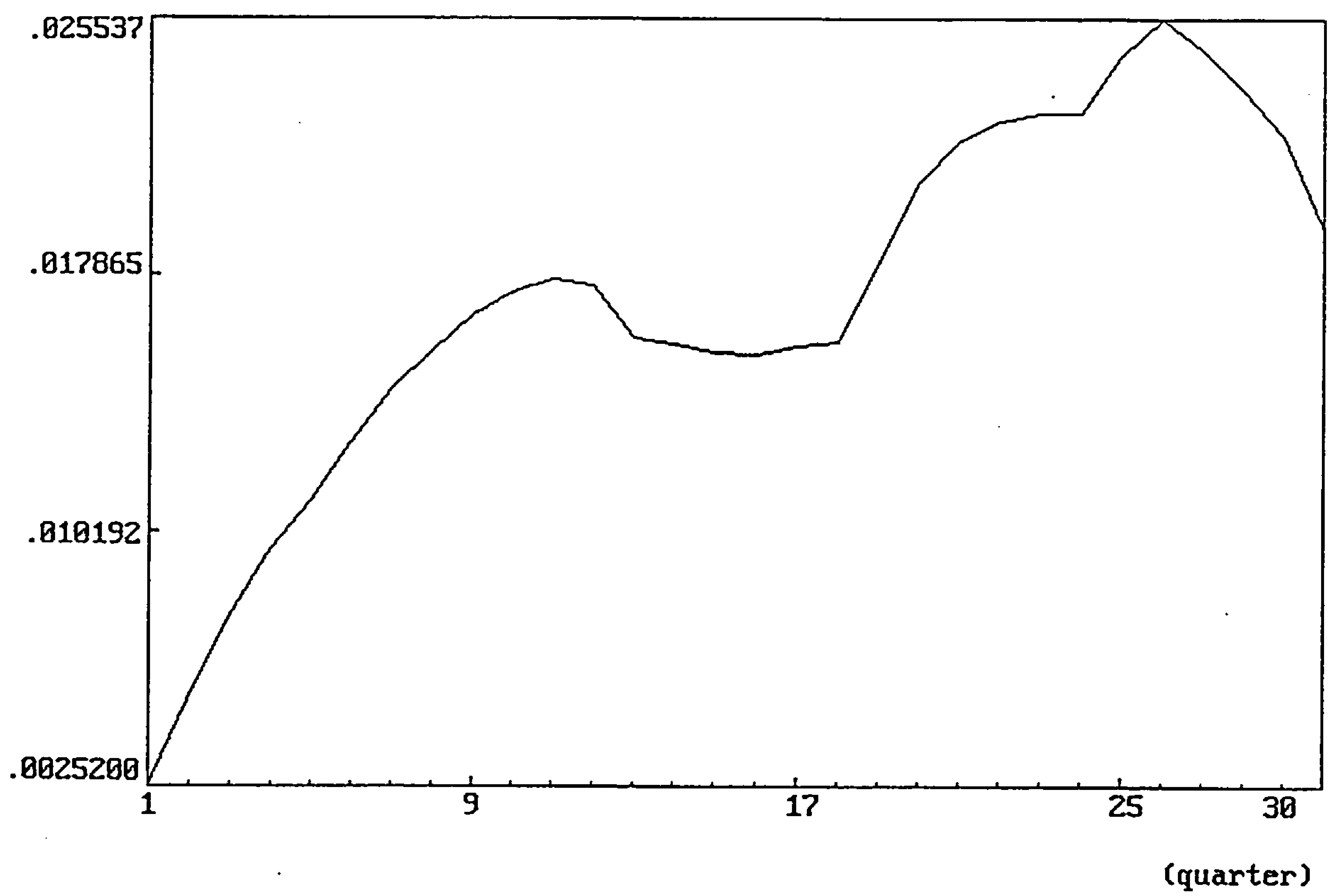


Figure 6.11 Variance Ratio of Real Effective Exchange Rate
(arithmetic approach)(REA)

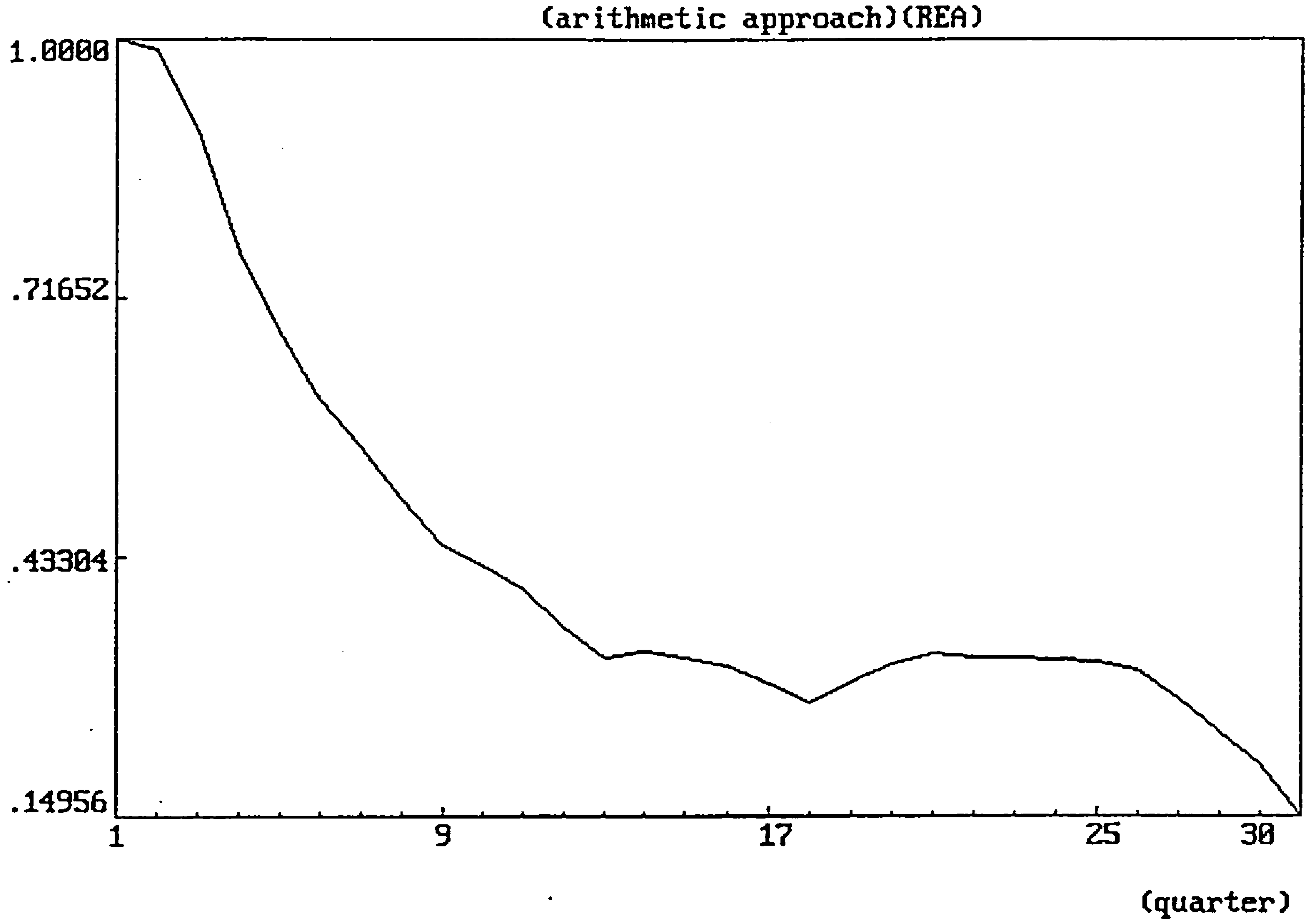
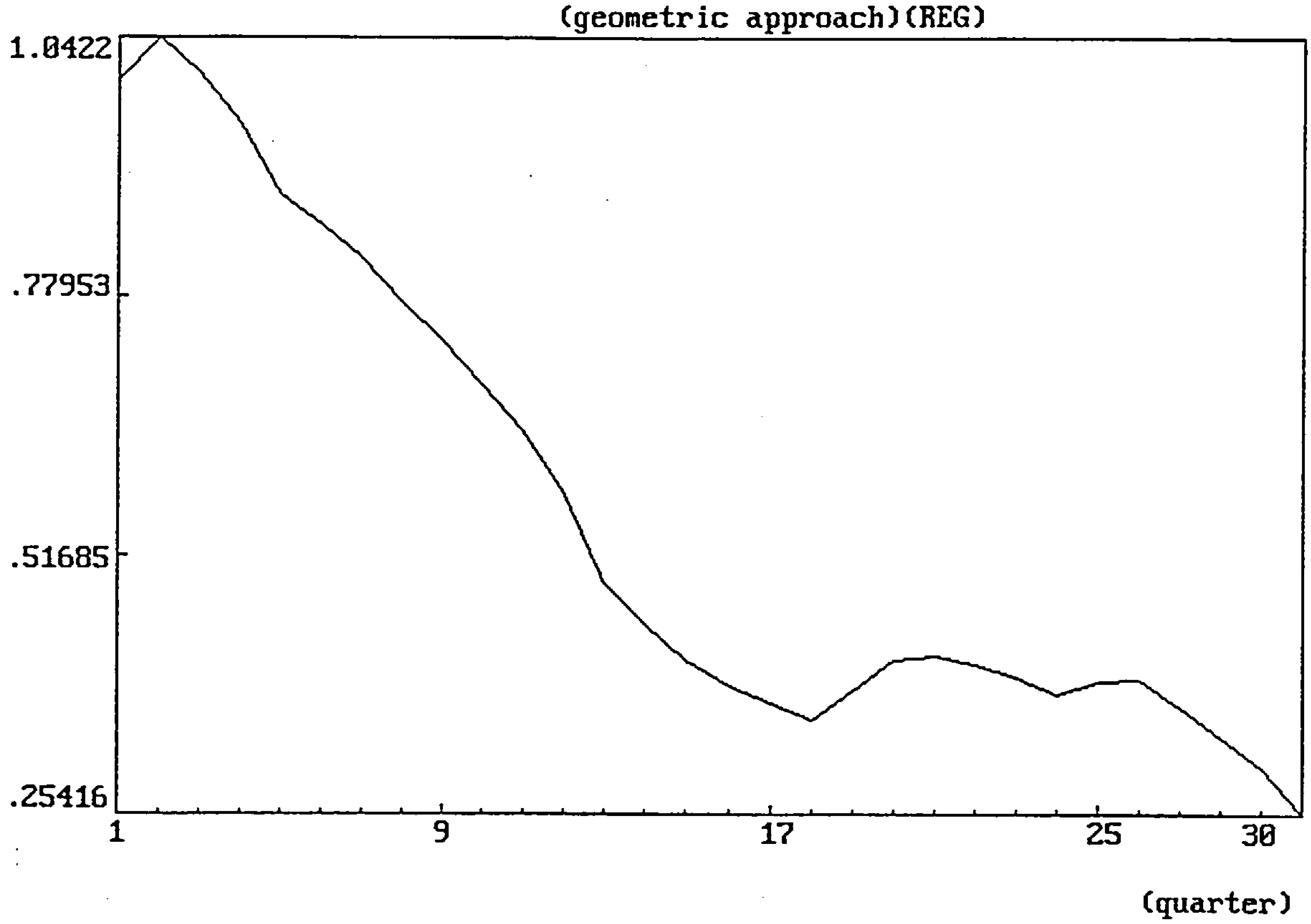


Figure 6.12 Variance Ratio of Real Effective Exchange Rate (geometric approach)(REG)



Chapter 7 Trade Dependence, Common Trends and Currency Area

7.1 Introduction

Contrast to slow economic growth in the western countries, the East Asian countries have experienced rapid economic development in the eighties. The gravity of economic dynamism has shifted from the West to the Asia Pacific region. The strong export performance of the newly industrialised economies (NIEs) witnessed superior economic development and export-led trade growth in the past two decades. The second tier of the NIEs, such as Thailand, Malaysia, Indonesia and the Philippines, individually commenced economic and financial reforms. China also started economic reform at the late seventies. The economic dynamism, combining with substantial foreign direct investment from the developed countries, led to unprecedented investment opportunities and economic surge in the Pacific Rim area.

The economic success in the Pacific region naturally merges with the idea of mutual cooperation among neighbouring countries. Intra-regional export trade, allocation of resources and high degree of complementarity, foster the process of economic cooperation. Das (1993) provides a summary for the institutional initiatives of regional cooperation. Table 7.1 shows the time schedule of institutions for regional economic collaboration. The Pacific Free Trade Area (PAFTA) was primarily institutionalized in 1966, which was searching for economic assistance and trade development within the regional economies. In those institutions, the Association of South East Asian Nations (ASEAN) and the Asia-Pacific Economic Cooperation forum (APEC) were among the most important establishments. ASEAN was founded in 1967 with six founding members: Indonesia, Malaysia, Singapore, Thailand, Brunei and the Philippines. The intention was to "promote economic cooperation in areas of trade, industry, energy, tourism, forestry, minerals, food and agriculture, and finance" (Panagariya, 1994b). Trade cooperation was encouraged by the Preferential Trading Agreements (PTA) in 1977. The APEC forum was first convened at the end of 1980s. There were initially 12 members from the Asia-Pacific countries holding ministerial meeting in Australia. The prime responsibility was to make mutual effort to fortify multilateral trading system after the success of the Uruguay Round negotiations (Suh, 1994). Economic integration and cooperation via intra-regional trade and industrial development contribute to the promotion of open regionalism. Therefore, the degree of interdependence of trade among East Asian countries is very significant.

In view of exchange rate stability, a common currency may be applicable to these countries. One of the fundamental issues for the establishment of a currency area within a region is to reduce real exchange rate variability. High export and economic growth rates as well as different degrees of trade, economic and financial liberalization epitomize the characteristics of the East Asian economies. The export indices simply reflect the competitiveness of trade transactions in the international market. Hence, it is suitable to construct real export exchange rates and test whether the nations can form a common currency area. The establishment of a common currency area can mitigate external shocks in both short run and long run and thus reduce the likelihood of real exchange rate variability. The main focus of this chapter is to investigate any possible common currency area in the East Asia context. Special attention is to give accounts to the economic impacts between Indonesia and her trading partners. The steps we investigate are as follows:

1) Firstly, trade dependence of Indonesia and her main trading partners is analyzed. Following Goto and Hamada (1994), we calculate the Trade Dependence Index, which measures the extent of trade between Indonesia and her trading partners.

2) A high percentage of trade dependence means that there is likelihood for deeper economic integration. Targeting a stable exchange rate environment within the countries can facilitate economic integration. The idea for exchange rate convergence is similar to the concept of ERM in Europe. Hence, it is possible to investigate exchange rate convergence in the region. Pearson Coefficient Correlation and Cronbach's standardized coefficient alpha are used for measuring the degree of convergence.

3) So far the Trade Dependence Index shows the relative trading strength of the bilateral countries, and the Cronbach's standardized coefficient alpha measures the cohesion for the groups of trading partners, the time series properties of real export exchange rates, however, are ignored in the long run. Recent research on currency area is to understand the statistical nature of the time series. The real exchange rate is commonly derived from the purchasing power parity (PPP). The tests for the validity of PPP are usually based on the bilateral exchange rates. In view of a currency area, one should test the "multi-" lateral rates as a whole. Enders and Hurn (1994) develop the theory of Generalized Purchasing Power Parity (GPPP) to explain the multi-real exchange rate behaviour. They claim that real exchange rates are non-stationary because the fundamental economic factors driving the movement of real exchange rates are indeed non-stationary. Using the concept of cointegration, real exchange rates would share a common stochastic trend if the fundamental variables were integrated, say, in a currency area. By applying Johansen's multivariate cointegration technique, we try to find any possible common stochastic trends within a system of real exchange rates. The application of Generalized Purchasing Power Parity aims to investigate the long run properties in a system of real exchange rates.

4) In contrast to Enders and Hurn's paper, we use export indices to construct the real exchange rates. We prefer to use export indices to wholesale or consumer price index because export indices include exportable manufacturing goods. The international market determines the export price of manufacturing goods. The use of the export indices can reflect a country's export competitiveness in the international market. The Real Export Exchange Rate (REER) thus serves as a better indicator to measure domestic export's manufacturing prices. Since the largest economic influences in the Pacific-Rim area are Japan and the U.S., their influences in the foreign exchange rates may create the so-called Yen or Dollar blocs. Hence, it is better to select a small open economy like Indonesia as the base country for constructing the bilateral real export exchange rates. Indonesia's economic and trade openness provides a good paradigm for modelling real export exchange rates in the developing countries.

The sections of this chapter are as follows: Section 1 is the Introduction. Section 2 analyzes the pattern and the characteristics of economic growth in the Asia-Pacific region. Literature survey on open regionalism is also included in this section. Section 3 shows the construction of real export exchange rates. Section 4 presents the trade dependence indices. Pearson Coefficient Correlation and Cronbach's standardized coefficient alpha are used to quantify the convergence of real export exchange rates. Section 5 discusses the common stochastic trends and the concept of GPPP. Empirical studies for a common currency region are in Section 6. Concluding remarks are presented in the final section.

7.2 Pattern of Regional Economic Growth

7.2.1 Characteristics of Economic Growth

A full swing of economic reforms has been swept throughout the East Asian countries in the last decade. Following the economic success of the NIEs, other Asian countries, notably the ASEAN, also implemented trade, industry and financial reforms. The rapid income growth in East Asia, characterised by superb export performance, projects high degree of economic interrelation in the region. Frankel (1992) and Frankel and Wei (1992) assess the role of Japan to economic development in East Asia. Using a gravity-model for bilateral trade flow estimation, they find that the level of trade in East Asia is actually biased intra-regionally. The Japanese yen plays a crucial role in intra-regional trade. Even though there is a steady growth in use of yen as the invoicing currency, most of the East Asian countries have still strong links with the North American economies.

Table 7.2 summarizes main macroeconomic indicators in the region. The table show sample means of GDP growth, inflation rate, foreign direct investment/GDP and export/GDP ratios from 1974 to 1991. The countries shown in the table are that of those with significant bilateral trade with Indonesia. The East Asian countries experienced a two-digit nominal GDP growth, which is much higher than their counterparts in the West. The real GDP growth in the East Asia is also higher than the western countries except the Philippines. However, the inflation rates in the region, on average, are especially higher in the countries like South Korea, Indonesia and the Philippines. On the whole, the real GDP growth in the East

Asia Pacific region is striking. South Korea, Malaysia, Singapore, Thailand, and Indonesia have more than 5 percent real growth, compared with only 2 to 3 percent growth to the western counterparts.

For investment/GDP ratio, the East Asian countries attract foreign direct investment from the rest of the world. The direct investment covers investment from aboard (credit), net of disinvestment (debit), and direct investment enterprises operating in Indonesia. Malaysia and Singapore benefit from the highest foreign direct investment/GDP ratios, about 3.8% and 7.5% respectively. The export/GDP ratio indicates that many of the East Asian countries have their export sector expanded. Singapore, in particular, shows the importance of both export and re-export trade. The last column is the exchange rate changes and the currencies are calculated in per US dollar. A positive exchange rate change means there is a depreciation of domestic currency against per US dollar. Like Japan, Singapore is the only country that the currency has been appreciated against US dollar in the East Asia. The average change is about 2.2%. South Korea, Indonesia and the Philippines have widely adjusted their exchange rates against the dollar. It is believed that the authorities in those countries have made appropriate exchange rate policies to encounter internal and external imbalances.

We also divide the countries into regional groups. Singapore and South Korea are the Newly Industrialized Economies (NIEs).[1] The ASEAN five are Malaysia, Thailand, Singapore, Indonesia and the Philippines. France, United Kingdom, Germany and Netherlands belong to the European countries. Lastly, the APEC are comprised of eleven countries, including ASEAN, NIEs, Australia, New Zealand, Canada and the United States. The second half of Table 7.2 indicates the sample means of different regional groups. NIEs and ASEAN have the highest nominal and real GDP growth. The Foreign direct investment/GDP and Export/GDP ratios of NIEs and ASEAN are higher than the European and APEC countries. However, the ASEAN experienced the severest inflation problem throughout the sample period; and the fluctuations of exchange rates were, on average, more frequent than the other groups. The economic dynamism on the whole has gradually shifted from the West to the East Asia Pacific region.

Table 7.3 shows the standard deviation of the macroeconomic indicators. Countries of the NIEs and ASEAN are more deviated from the mean than those do in the European and APEC countries. On the other hand, the standard deviation of exchange rate changes in Europe reflects frequent exchange rate adjustments in the EC. In a nutshell, economies of the East Asia Pacific countries have improved through a series of trade and financial reforms. The authorities share the same vision on real GDP growth, controlling inflation, attracting foreign direct investment, promoting export trade growth, and targeting real exchange rates to achieve economic balances. These common goals can be accomplished by further economic collaboration, which makes way to open regionalism in the Asia Pacific context.

7.2.2 Literature Survey on Open Regionalism

Much literature has discussed the integrated economic systems in Europe and in the North America (North America Free Trade Area, NAFTA). However; focusing on economic integration in the Asia Pacific region becomes pragmatic and prevalent direction of research. Goto and Hamada (1994) assess the degree of economic interrelationship in the Pacific area. They find that the East Asian nations depend heavily on trade with the United States and Japan. They argue that "it would be infeasible as well as unprofitable for East Asian nations to form an FTA (Free Trade Area) without the United States and Japan" (p.373-4). Since the degree of factor mobility is high among the nations, they assert that there is a strong rationale to create a common currency area in the East Asia. Frankel and Wei (1994) examine the exchange rate policies and evaluate any possible yen bloc or dollar bloc in the region. They conclude that the level of trade in East Asia, like the EC, is biased intraregionally. However, there is no evidence for any trend increase in the intraregional bias. The formation of a yen bloc gives no evidence with respect to both trade and currency links whilst the currency invoicing are mostly denominated in dollar. In fact, economic influence from the United States remains very strong and indispensable to the Asia Pacific region.

Green (1994) use macroeconomic data such exchange rates, interest rates and money supply growth rates to measure the degree of convergence and cohesion for the ASEAN-4 countries. The overall result suggests that the cohesion is increasing and apparent. For the exchange rate stability, the result particularly implies considerable cohesion in both nominal and real exchange rates. The exchange rate stability is therefore a pre-requisite for implementing stable financial and monetary policies. Martin and *et.al.* (1994) use a simple global general equilibrium model to give an assessment of integration initiatives. The results show that the gain produced by the Pacific liberalization is substantial, of which more than $100 billion US dollars can be generated among East Asian countries. Balassa and Noland (1994) forecast that the industrializing countries will continue in specializing export trade. It also suggests that the East Asia NIEs will gain from a common basket currency peg. They said, "this would avoid the dilemma of each country being reluctant to revalue its currency for fear of losing markets to the others. At the same time, revaluation would permit correction of imbalances in trade and the current account" (p.245). Moreover, regional economic growth can be affected by the major regional power like China. With abundant labour supply, this may eventually increase competition of the labour intensive manufacture exports.

Suh (1994) argues that the economic dynamism of the Pacific region has two characteristics. Firstly, economic complementarity among nations includes different socio-economic systems and development. Secondly, the growing linkages and interdependence of the economies depend on trade, investment, finance and technology. However, he stresses those regional economies should resolve frictions and disputes so as to enhance possible economic coordination. Strengthening the multilateral trading system and restraining the world economy from developing into trade blocs are the main issues and challenges for the Asian-Pacific countries in the future. Kim (1992) also shares the content of economic complementarity. He points out that the emergence of NICs in the Asia-Pacific has stimulated regionalism, notably within ASEAN that prompts to closer ties among neighbouring countries.

Another factor for economic integration is based on intraregional foreign direct investment. Kirkpatrick (1994) denotes that "the degree of production integration already achieved by transnationals' operations in the region has created pressure for regional policy coordination in those areas which will facilitate further integration at the production level. The policies that will enable the regionalization process to develop further, extend well beyond trade liberalization, and cover such issues as harmonisation of taxation of firms that have established regional operations.........and standardisation of commercial legislation" (p.199).

In regard to ASEAN, Reinhard (1993) points out that closer ASEAN cooperation can be successful, if ASEAN countries change their policies more rigidly in direction to more regional cooperation. On the other hand, ASEAN has to keep its market open and not to raise tariff and non-tariff barriers against third country producers; and the strongly inward-looking economic cooperation should be kept in mind. The view also shared by Chambers (1993) that regionalism is not a substitute for multilateralism. Plummer and Iboshi (1994) analyze the economic implications of NAFTA for ASEAN members. They propose that ASEAN can provide better environment for trade and investment; and have closer economic ties with NAFTA countries and the other Asia-Pacific nations.

Compared to the economic regionalization in EC, Dutta (1994) points out that it is far more important to have monetary and fiscal coordination to facilitate stable intra-regional economic growth in Asia-Pacific, though the region is more divergent in economic and technological development. Contrast to the previous survey, Panagariya (1994a) indicates that regionalism in the East Asia is still pessimistic; arguing that "a discriminatory bloc is neither particularly desirable nor feasible. A non-discriminatory approach could yield high returns in the long run, but because its short-term effects on the terms of trade are likely to be negative, it is an unlikely development" (p.19). Lawrence (1994) agrees the fact that sooner or later the regional integration will be supplemented by multilateral initiatives. Nevertheless, he questions whether regional integration leads to "'building blocks' in a more integrated global system or 'stumbling blocks' that cause the system to fragment" (p.385).

In the concept of open regionalism, the survey states that it is possible to have economic coordination within the Asia-Pacific region, in view of export complementarity, exchange rate realignments, monetary and fiscal arrangement, increased factor mobility and goods market integration. Since the chapter is focusing on a feasible currency area, the drive for exchange rate realignments will be the basis for discussion.

7.3 Construction of Real Export Exchange Rates

One of the fundamental issues to establish a currency area within a region is to reduce the real exchange rate variability. The real exchange rate stability between two currency areas implies that real exchange rate adjustment from shock is small, and the opportunity cost for giving up nominal exchange rate flexibility will be small (von Hagen and Neumann, 1994). Since fundamental economic variables can affect real exchange rates, it is advisable to select some common measurements to reflect the concerted exchange rate movements. As NIEs and ASEAN countries have already commenced trade and economic liberalization in the past one or two decades, export-promotion becomes the underlying strategy for economic growth. The export prices also represent export competitiveness in the international market. Hence, it is feasible to use export price indices to construct real exchange rates. Table 7.2 shows that export-to-GDP growth, on average, has achieved a two-digital growth in each Asian country. A strong export growth concludes that it is much better to use export price to measure real exchange rate variability than those of other price indices, i.e. wholesale price index[2] or consumer price index. Another aspect of investigation is to understand possible currency coordination of Indonesia with other Asia-Pacific countries. Therefore real export exchange rate (REER) series is constructed and Indonesia is used as the base (domestic) country. REER is defined as follows:

$$R_{ij} = E_{ij} \bullet \left(\frac{P_j}{P_i}\right) \tag{7.1}$$

where i is Indonesia and j is a foreign country. E_{ij} is the value of Rupiahs per foreign currency of country j. P_j is export price of country j and P_i is Indonesian export price. Hence, R_{ij} is the real export exchange rate of each foreign country using Indonesia as the base country. An increase in REER means there is a currency depreciation of Rupiahs against per foreign currency. We select eight countries for estimation and they are:

NIEs:	Hong Kong, Korea, Singapore and Taiwan;
ASEAN:	Malaysia, Singapore, Thailand and the Philippines;

These countries are chosen because they are the main export neighbouring partners of Indonesia. All prices and exchange rates data are extracted from *International Monetary Fund, CD-Rom, 1995*, except Taiwan. Since there are no export indices for Singapore and Thailand, we use wholesale price index (WPI) for these countries.

Nominal exchange rate is extracted from code AE, the end-period data. The data of Taiwan is obtained from Pacific-Basin Capital Markets (PACAP) Databases, 1992.[3] The sample period is from 1975 Q1 to 1991 Q4, quarterly data. All data are normalized so that 1975 Q1 equals to zero. The series are in logarithmic form:

$$R_{ij} = E_{ij} + P_j - P_i \tag{7.2}$$

7.4 Trade Dependence and the Convergence of REER

7.4.1 Trade Dependence of Indonesia and the Main Trading Partners

In section two, we discussed that most of the Asia-Pacific nations enjoyed high real economic growth. The stylised fact is that they are steering their trade policy toward export promotion. In his article, Pangestu (1994) points out that Indonesia have suffered from oil price decline, balance of payment worsened and increased in external debts in the mid-eighties. However, trade and financial deregulation after 1986 has contributed a strong export-oriented drive. The export-oriented activities of domestic and foreign investors have provided large investments for export market (p.228). The evidence of intra-regional trade is apparent. In order to evaluate trade dependence of Indonesia and her main trading partners, an trade dependence index is therefore tabulated.

Following Goto and Hamada (1994), an trade dependence index measures the extent of a country depending on trade with a trading partner, or the intensity of a country being threatened by a trade embargo by a specific trading partner. The index calculates the total amount of export and import of a country with a specific trading partner as a percentage of a country's GDP. The data source is taken from the International Monetary Fund's *Direction of Trade*, various issues.

7.4.2 Trade Dependence Indices

Table 7.4 shows the trade dependence indices of Indonesia and the main trading partners in three phases, 1981, 1986 and 1991. The figures are in percentage. The 1986 is the benchmark indicating Indonesia's trade and financial deregulation. The statistics should be read like this: For example, the trade dependence index of Hong Kong in 1986 is 0.702 – it means that Hong Kong's trade with Indonesia is about 0.7% of Indonesia's GDP. The Table draws some implications:

1) Japan, the United States and Singapore are three main trading partners, or most of Indonesia's export trades are dominantly dependent on these three countries;
2) Trades are more intra-regionally after deregulation in 1986, since the years of 1986 and 1991 (1986/91) indicate positive change among the Asia-Pacific nations (except Japan) with Indonesia;
3) Even though Japan and the United States are the most important trading partners, the indices show the overall dependence decline as compared to 1986/91 and 1981/91 change;
4) In regard to regionalism, the indices overall show a trade dependence decline in NIEs and ASEAN countries in 1981-86. However, there appears positive changes in the periods of 1986-91 and 1981-91, (except ASEAN in 1981-91);

Trade and financial liberalization in Indonesia increased total trade and diversified the direction of trade in the international market.

7.4.3 Cronbach's standardized coefficient alpha (α) and Pearson correlation coefficient

Trade dependence indices indicate a trade closeness between Indonesia and the trading partners, in terms of volume and the direction of trade. Regional economic cooperation will be fostered by exchange rate stabilization, trade and tariff adjustment, capital flows, mutual monetary and fiscal policies. Among those macroeconomic variables, stabilization of exchange rates can accelerate the development of exchange rate mechanism as well as inter-country economic relations in the Pacific region. The mechanism is somewhat similar to the ERM in Europe, which results to deeper economic integration. The convergence of exchange rates with a group of countries can mitigate from external shock and fluctuation of exchange rate changes. Green (1994) uses Cronbach's standardized coefficient alpha[4] (α) to indicate the convergence of the macroeconomic variables. A positive value represents convergence of a paired variables, whilst a negative value indicates a variable diverge from one another. The standard coefficient alpha (α) is tabulated as:

$$\alpha = \frac{qr}{1 + (q-1)r} \tag{7.3}$$

and

$$r = \frac{2}{q(q-1)} \sum_{all\, m,n}^{q} \sum_{m \prec n}^{q} \rho_{mn} \tag{7.4}$$

where r is the average value of Pearson correlation coefficient; r_{mn} are different pairs of two countries, m and n, and q is the number of the countries. The application of Cronbach's standardized coefficient alpha is to measure possible exchange rates cohesion/collaborationin a currency region. The statistics provides a specific value to each group of countries in a discrete time span.

According to Eq. 7.4, we first construct Pearson correlation coefficients[5] for a pair of two countries. The nations are ASEAN, NIEs, Japan and the United States. We want to find out the direction and the amount of association of real export exchange rates with a pair of countries in the Asia-Pacific region. Including Japan and the United States are crucial because these countries are the most important trading partners in the area.

Table 7.5 shows the Pearson Correlation Coefficients for the pairs of the countries, using real export exchange rates with a sample size from 1975:1 to 1991:4 inclusive. The statistics shows that the values are positive and have the same direction. The values mostly range from 0.8 to 0.9, indicates a strong correlation between two countries. Overall, the Philippines has the least association with the trading partners -- 0.342 with Indonesia and about 0.6 with other countries. Compared to Indonesia, the correlation result shows that Singapore is among the highest, whilst the United States the second.

Singapore is one of the most important trading country in the region. Trading with the United States, on the other hand, is obviously not to be disregarded.

Table 7.6 shows Cronbach's standardized coefficient alpha (α), which is a statistical device for measuring the exchange rate convergence. We divide the countries into different groups according to their institutional initiatives. For the NIEs, the value of (α) is 0.969 which is higher than the ASEAN countries. It explains that Hong Kong, Korea and Singapore have been successful in export promotion and the REERs simply reflect their export prices in the world market. Moreover, the speed of ASEAN's trade and financial liberalization was slower and not until 1980s had each government make certain amount of trade, monetary and fiscal reforms to revitalize their economies. If we add NIEs and ASEAN together, we discover that the value of (α) is larger than each individual group.

The influence of Japan and the United States cannot be disregarded. We find that with the inclusion of Japan and the United States into each group, the coefficients, (α's), are higher. It states that it is infeasible to exclude the economic influence of Japan and the United States in the region.

7.4.4 Conclusion

The statistical results of trade dependence index and Cronbach's standardized coefficient alpha confirm that there is a strong trade interaction between Indonesia and the other Asia-Pacific countries. Among them, Singapore and the United States are Indonesia's main trading partners. The standardized coefficient alpha values, based on the Pearson correlation coefficients, show that there is a strong real exchange rate convergence with different economic groups. A stable real export exchange rate policy among the Asia-Pacific countries leads to higher volume of trade and reduces external shocks from other currency area. The statistics provide specific values in a discrete time span. The properties of real exchange rate in the long run therefore, remains in the next section for discussion.

7.5 Common Stochastic Trends and the Basket of Real Export Exchange Rates
7.5.1 Common Trends and Systems of Bilateral Exchange Rates

Traditional view of Purchasing Power Parity (PPP) emphasizes on the fact that nominal exchange rate is driven by the ratio of domestic and foreign prices. The doctrine of PPP fails to explain the co-movement of price and exchange rates, at least in the short run.[6] The inadequate explanation of PPP implies that there exists persistence of the real exchange rate changes. The fluctuation of real exchange rate simply reflects the exposure to asymmetric shocks. Literature on the currency basket suggest that factors like optimal weighting scheme, factor mobility, trade integration and reduction of the variability of real exchange rates are the pre-requisite for a currency area.[7] Among those authors, Branson and Katseli (1982) compute the weights for a currency basket aiming at stabilizing trade balance. They show that "pegging to a currency basket is the same as holding constant a real exchange rate that uses a specific set of weights depending on chosen policy target" (p.195). Tavlas (1993) provides a new concept for the optimum currency areas. He states that a new theory should be in line with developments in expectation formation, time inconsistency and credibility problems, labour mobility under conditions of uncertainty, and exchange rate determination.

Caporale (1993) uses principal components analysis to determine whether disturbances are driven by symmetric or asymmetric shocks. Symmetric shocks are created by Community-wide (a group of countries, for example, EC) whilst asymmetric shock is created by a specific country. It is shown that the asymmetric shocks actually account for a sizeable percentage of GDP fluctuations in the EC, which leads to the conclusion that the operation of a currency union could be rather difficult.

Bayoumi and MacDonald (1999) use panel data set for real exchange rates of 20 countries and comparing the time series properties of these data with comparable data sets with two monetary unions, the US and Canada. They use CPI and WPI for constructing real exchange rates. They confirm that relative price variability within countries is considerably lower than across countries, and that real exchange rates appear stationary, or mean reverting, across countries. Moreover, they also find that the relative prices have significant long-run trends. This implies that underlying real factors can create long-run trends in relative prices even in a fairly homogenous environment. They argue that while nominal shocks may be mean reverting over the medium term, generating the observed mean reversion in real exchange rates, this medium-term effect obscures the fact that underlying real factors generate long-term trends in real exchange rates.

Taylor and Sarno (1998) apply panel unit root tests to real exchange rates among G5 during the post-Bretton Woods period. They argue that interpretation of the unit roots should be with caution since rejection of the null hypothesis of joint non-stationarity of a group of real exchange rates may be due to as few as one of the exchange rate series under investigation being generated by a stationary process. They prefer to use Johansen likelihood ratio test as only at least one of the series is generated by a non-stationary process. This null hypothesis will only be violated if all of the series in question are realizations of stationary processes. With the G5 CPI-adjusted real exchange rates quarterly data, the null hypothesis of at least one of the exchange rate series is a realization of a unit root process is rejected, the evidence of real exchange rates among the G5 are apparently mean reverting over the floating rate period.

Focusing on the currency area, it is certain that the movement of real exchange rate is vital not only to an individual country, but also affects the community in a region. In the Asia-Pacific region, economic cooperation would be possibly achieved and fostered through expansion of trade and financial liberalization. Tjipoherijanto (1993) argues that Indonesia accomplished more trade liberalization than any other ASEAN countries in the eighties; common real exchange rate realignment can promote regional cooperation and common interest to economic development. As countries in the Asia-Pacific region steer to export-promotion in manufacturing industries, understanding on the movement of real export exchange rates (REER) can provide fundamental criterion for creating a possible common currency area.

There is a general agreement that most of the economic time series data are non-stationary. Statistically speaking, the non-stationarity properties of real variables are integrated of order one, $I \sim (1)$. However, cointegration implies a linear combination of variables that will be $I \sim (0)$ even though the variable is individually $I \sim (1)$. Cointegration therefore indicates a vector of variables that have co-movement in the long run. The meaning of co-movement needs some explanations. Lippi and Reichin

(1994) define that long-run and short-run co-movements have different implications.[8] The long-run co-movement provides information about steady-state relations while the short-run gives about the business cycle. Cointegration implies common random walk components. If the trend has a random walk component, it also implies the presence of common trends. Vahid and Engle (1993) explain that cointegration is an indication for co-movement among non-stationary variables. "When the variables are cointegrated, they share some common stochastic trends that drive their long swings, and at least one linear combination of them exists which has no long swings, i.e. is stationary" (p.341). According to the Stock and Watson's Common Trends Representation[9] (1988), it states that if each of n series is integrated of order 1, but can be jointly characterised by $k < n$ stochastic trends, then the vector representation of these series has k unit roots and $n - k$ distinct stationary linear combinations. Therefore, cointegration of a vector of variables means that the number of unit roots in a system is less than the number of unit roots in the univariate series. In view of PPP, Moore (1993) argues that PPP should not be tested as a series of separate bilateral relationships, but a country's set of bilateral real exchange rates should be tested as a complete system. The system of bilateral exchange rates accordingly constitutes the theory of Generalised Purchasing Power Parity (GPPP).

7.5.2 The Concept of Generalized Purchasing Power Parity

The basic thought behind GPPP is developed by Enders and Hurn (1994). The rationales of GPPP come to twofold: Firstly, the real fundamental macroeconomic variables affecting the determination of real exchange rate are themselves non-stationary, therefore real exchange rate movement is non-stationary. Secondly, in a well-defined currency area, the driving force of real fundamentals will be interacted for the real exchange rates to share a reduced number of common trends. Recalled the Stock and Watson's Common Trends Representation (1988), each bilateral exchange rate is integrated of order 1[10], but can be jointly characterised by $k < n$ stochastic trends, where n is the number of the series. Then the vector representation of these series has k unit roots and $n - k$ distinct stationary linear combinations.

In a GPPP currency area, each real export exchange rate series is non-stationary but can share a common stochastic trend(s) within a system of real export exchange rates (REER). With continued trade and financial liberalization, export-promoting countries in the East Asia may share some common real fundamentals to increase their competitiveness and economic coordination. The intra-regional trade, capital movement from both local and foreign investors drive the co-movement of REERs. A shock of a country's exchange rate will directly affect another country's exchange rate through an integrated, and intra-regional currency area. The REERs are expected to share some common stochastic trends.

7.5.3 The Methodology

Testing common stochastic trends can be used by the Johansen's (1988) maximum likelihood estimation technique. The advantage of using multivariate cointegration is that there is no *priori* assumption on the uniqueness of the cointegrating vector(s). Moreover, Johansen's test can eliminate biases against small sample measurement errors. Consider an *n*-dimensional VAR:

$$X_t = \prod_1 X_{t-1} + \prod_2 X_{t-2} + \ldots\ldots + \prod_k X_{t-k} + \varepsilon_t \tag{7.5}$$

where X is an nx1 random vector in I(1) order and t = 1,..., T. e_t is i.i.d.. Since Eq. 7.5 appears to be non-stationary, a first difference form of Eq. 7.6 is written as:

$$\Delta X_t = \sum_{i=1}^{k-1} \Gamma_i X_{t-i} - \prod X_{t-k} + \mu_t \tag{7.6}$$

where

$$\Gamma_i = -I + \prod_1 + \ldots. \prod_i, \quad \prod = I - \prod_1 - \ldots \prod_k \tag{7.7}$$

The test is to examine *nxn* Π matrix. When the matrix has a full rank *n*, then the elements of series X are stationary. If the element of series X has the rank such that rank(Π) = $r < n$, there are r cointegrating vectors among the elements of series X and n - r common stochastic trends. The matrix Π can be decomposed into two matrices a and b and:

$$\alpha\beta' = \Pi \tag{7.8}$$

β is the cointegrating vector that analyses the long-run relationship of series X and α is the adjustment vector that captures the speed of adjustment. The trace test procedure of Johansen's multivariate cointegration technique is used for empirical analysis.[11]

7.5.4 Literature Survey on the Use of Common Trends

One of the earliest tests for a system of exchange rates is carried out by Baillie and Bollerslev (1989b). Using exchange rates data of the developed countries, Baillie and Bollerslev apply Johansen's test and find that the presence of one common stochastic trend is among the set of seven daily spot and forward rates. They conclude that seven exchange rates are tied together in a long-run relationship. Similar results are also found in Crowder (1994) where one cointegrating vector is present among the variables. Hafer and Kutan (1994) use Johansen's technique to test for German dominance in the EMS. Using interest rates and monetary bases as the instruments, they find the existence of several common trends. The result implies that German policy has not universally shared by the other countries, and hence a complete convergence hypothesis is rejected for German dominance. Phylaktis and Kassimatis (1994) examine the black market rates for eight Pacific Basin countries. They find that seven stochastic trends are present in a full eight-dimensional system determining the nominal exchange rates. The finding of a common trend, they argue, can stem from the fact that most of these countries are linked with the US dollar, which gives substantial influences on capital account and international trade. Moore (1993) asserts that PPP cannot be tested in a bilateral exchange rate basis, rather it should be tested as a complete system. Using monthly and annual data set of seven industrialised countries, he finds that only the full set of unit roots of monthly data cannot be rejected. He concludes that "the notion that long-run PPP holds for all the six real exchange rates appears to be untenable for the annual as well as the monthly data" (p.1164). Serletis (1994) studies a system of black market exchange rates in the Eastern Europe. The evidence provides strong support of four cointegrating vectors and three stochastic trends, indicating that the black market exchange rates are linked together in the Eastern Europe.

Some authors test the existence of common stochastic trends in stock exchange markets. Based on Kasa's work (1992) on common stochastic trends, Chung and Liu (1994) investigate the trends among five Asian stock markets as well as the US market. They find that only four countries share the same common stock region, except those of the US and Taiwan markets. The result also shows that most variables have the same adjustment speed in moving from short run disequilibria. Jeon and Chiang (1991) investigate a system of stock exchange in the global content. The evidence shows that there are three unit roots in a system of the world's four largest stock exchange, suggesting the existence of one common stochastic system. They conclude that a globalization of world stock exchange markets has been accelerated especially in the eighties.

Arshanapalli and Doukas (1994) analyze seven Eurocurrency deposit rates. The evidence shows that for each five dimensional maturity structure there are two common stochastic trends binding the intra-currency deposit rate together. The result is consistent with the view that investors in the Eurocurrency market do not make profitable opportunities across maturities to last for long (p.1053). Studies of common stochastic trends on the metal prices are also found in Agbeyegbe (1992) and Labson and Crompton (1993). Agbeyegbe (1992) finds the presence of common stochastic trends in metal price movement whilst Labson and Crompton (1993) gives little support on the long-run equilibrium relationship between income and metals consumption.

7.6 Empirical Results of the Common Currency Region

7.6.1 The Fluctuation of Real Export Exchange Rates

Figures 7.1 to 7.9 show the real export exchange rates of nine countries and city states. Indonesian Rupiahs is the base currency. The bilateral exchange rate is defined as the amount of Rupiahs per foreign currency. An increase of real exchange rate means a depreciation of Rupiahs against a foreign currency. The sample period covers from 1975 to 1991, quarterly data. The figures have drawn some characteristics: Firstly, the series are mostly non-stationary in nature. The non-stationarity are due to the changes of relative export prices as well as nominal exchange rates. Secondly, devaluations of the Rupiahs have caused two jumps in the series. Two important devaluation periods were in March, 1983 and September, 1986, of which Rupiahs had been devalued against US dollar by 28% and 31% respectively. The values of real export exchange rates were suddenly declined after devaluations. Thirdly, the patterns of the real export exchange rates are similar across countries except the Philippines. The fluctuation of Rupiahs/Peso is much greater than the other bilateral exchange rates.

7.6.2 Unit Root Tests for Stationarity

The presence of a unit root means that the series is not stationary. In order to test for the stationarity, a series is generally written in an autoregressive representation:

$$\Delta S_t = \alpha_0 + \alpha_1 T + \alpha_2 S_{t-1} + \sum_{i=1}^{k} \beta_i \Delta S_{t-1} + \varepsilon_t \tag{7.9}$$

where ε_t are assumed to be identically, independently distributed random variables. α_0 and T are constant and time trend respectively. The null hypothesis of a unit root is tested whether $\alpha_2 = 0$.

Three unit root procedures are performed, namely, Weighted Symmetric test (tau), Augmented Dickey-Fuller test (tau), and Phillips-Perron test (non-parametric). Each test allows for a series of augmented lags in order to control the additional serial correction.[12] The Weighted Symmetric test is a weighted double-length regression and the test is preferred to Dickey-Fuller test as the former has higher power.[13] Phillips-Perron test can tackle the problem of serial correlation in the residuals which is robust to autocorrelation.[14] We also provide the asymptotic P-values with reference to MacKinnon (1994). The optimal lag length for each series is also supplied by TSP (see Hall, 1995, p.40).

Table 7.7 reports the unit root test of the real export exchange rate for the Asia-Pacific countries. All the series are in logarithmic form. The parenthesis indicate the asymptotic P-values. The statistical results of the three tests, notably, Weighted Symmetric, Dickey-Fuller and Phillips-Perron, suggest that the null hypothesis of a unit root is not rejected for all the series. It means that the series are indeed non-stationary. In order to confirm the series are in $I \sim (1)$ process, first differenced of the series are performed. Table 7.8 shows the results. The P-values indicate that the null hypothesis is rejected at 5% significant level and hence the real export exchange rates of Asia-Pacific countries are non-stationary.

7.6.3 Empirical Results and the Application for the Common Exchange Rate Region

A system of real export exchange rates may share a common stochastic trends. If a region is economic integrated and exposed to export-promotion environment, their real export exchange rates will be linked together. Each country can adjust its real export exchange rate simultaneously after being affected by a country's exchange rate shock. In an integrated region, it displays a co-movement of real export exchange rates in the long-run equilibrium. On the other hand, if one country's exchange rate is not shared in an exchange rate system, the country will not belong to the integrated region since its exchange rate is not tied to the system in the long run. The evidence of common stochastic trend, therefore can be analyzed by Johansen's multivariate cointegration test.

We divide the countries into different groups according to economic and political considerations. The groups are as follows:

Group 1) Newly Industrialized Economies (NIEs): Hong Kong + Singapore + South Korea + Taiwan - Table 7.9;

Group 2) Association of South East Asian Nations (ASEAN): Malaysia + Singapore + Thailand + Philippines - Table 7.10;

Group 3) NIEs + ASEAN: - Table 7.11;

Group 4) NIEs + Japan: - Table 7.12;

Group 5) ASEAN + Japan: - Table 7.13;

Group 6) NIEs + ASEAN + Japan: - Table 7.14;

Group 7) NIEs + US: - Table 7.15;

Group 8) ASEAN + US: Table 7.16;

Group 9) NIEs + ASEAN + US: Table 7.17.

Group 1 is the NIEs, which enjoyed export-promotion economic growth in the eighties. Group 2 is the ASEAN, which is widely described as the second tier of NIEs. Groups 3 is the East Asia region. Given the influential economic power of Japan and US in the Asia-Pacific region, it is useful to add these two countries into each group. Groups 4 to 6 test Japanese economic influence while Groups 7 to 9 the US's. Johansen's trace test is reported in each table. Multivariate cointegration holds if the alternative hypothesis is at least $r \geq 1$, where r is the number of cointegrating vectors. The observations are totally 64. The critical values can be found in Osterwald-Lenum (1990). The optimal lag length is determined by the use Schwert's technique[15] (1987). Each table reports the trace statistics, the normalized cointegrated vector, β, and normalized adjustment speed, α.

Table 7.9 shows the statistical results of NIEs. The trace statistics is 59.033. It means that the null hypothesis of no cointegration ($r = 0$) is rejected at 5% significant level and it is in favour of $r \geq 1$. However, the null of $r \leq 1$ cannot be rejected. There is at least one cointegrating vector present in the NIEs or there are three common stochastic trends ($n - r = 4 - 1 = 3$) in the system. This implies that the four real export exchange rates share one long-run equilibrium relationship. Moreover, the normalized cointegrated vector, β, indicates the long run equilibrium equation as:

$$HongKong = 1.1362SouthKorea - 3.4808Singapore + 1.3512Taiwan \tag{7.10}$$

The explanation is that, for instance, a 1% change of Rupiahs/Hong Kong dollar will lead to a 3.48% change of Rupiahs/Singapore dollar. The change of Rupiahs/Singapore dollar is the greatest in the system. In view of error-correction mechanism, it means that there should be relatively larger movement for the Rupiahs/Singapore dollar to move back to long run equilibrium level after an initial shock. The last row of the table indicates the speed of adjustment, α. The Rupiahs/Singapore dollar is -0.4089. The larger the number, the faster the speed of adjustment will be. For the Rupiahs/Singapore dollar, it is interpreted that it takes a larger movement for the bilateral rate to get back to the long run equilibrium but with a rather quick speed of adjustment. One can imagine that the financial market in Singapore is open and mature indeed, and hence the adjustment is fast enough for the bilateral rate to get back in the long run.

Table 7.10 shows the trace statistics of ASEAN. The null hypothesis of $r \leq 1$ is rejected at 5% and it is in favour of at least two cointegrated vectors. Therefore, in the case of ASEAN, the four countries have two unit roots and shared two long run equilibrium relationships. For the normalized cointegrated vectors, βs, Rupiahs/Singapore dollar has the largest values. The vectors also can be interpreted as the economic weights in the system. The influence of Singapore economy in ASEAN is actually very strong.

When we add NIEs and ASEAN together, Table 7.11 shows that there are at least 3 cointegrated vectors or 4 common stochastic trends. Rupiahs/Singapore dollar again show the heaviest weights in the first two vectors. However, Rupiahs/Baht has the largest value in the third cointegrated vector. For the adjustment vector, α, Taiwan shows the least speed of adjustment. It is because the Taiwanese government has imposed capital control so that foreign exchange adjustment is relatively slow.

Tables 7.12 to 7.14 show the inclusion of Japan into different economic groups. The trace statistics report that there is an evidence of multivariate cointegration in different groups. In Table 7.12, it shows that there is at least one cointegrated vector in the NIEs system, at least three in the ASEAN system in Table 7.13 and at least five in the NIEs + ASEAN system in Table 7.14. The inclusion of Japan in the common exchange rate region can be reinforced by testing restriction on the cointegration coefficient of Japan. The test restriction is:

H_0 = zero coefficient of Rupiahs/Japanese Yen

$H_1 \neq$ zero coefficient of Rupiahs/Japanese Yen

In Table 7.12, the likelihood ratio (LR) for zero restriction of NIEs is tested with $\chi^2(1)$, where the number of degree of freedom is actually the number of linear combination in the system. The result is 0.10814. The P-value shows that the null is not rejected. It states that Japan may not belong to the NIEs region. However, the zero restrictions are rejected with the regions of ASEAN and NIEs + ASEAN. Table 7.13 shows the LR statistics of $\chi^2(3)$ is 26.6575 whilst the LR statistics of $\chi^2(5)$ is 32.6367 in Table7.14. Both P-values show that the zero restriction is rejected. Hence, economic influence of Japan in the Asia-Pacific is dominant.

For the influence of US in the East Asia, the trace statistics report the presence of cointegrated vectors. In Table 7.15, there are at least two cointegrated vectors to be found, whilst there is at least one in Table 7.16 and at least three in Table 7.17. By testing the zero coefficient assumption, the inclusion of US in NIEs (Table 7.15) and in NIEs + ASEAN (Table 7.17) indicate that the null hypothesis are rejected. On the other hand, Table 7.16 shows no sign of statistical rejection of zero coefficient between ASEAN and the US. In a nutshell, both Japan and US are the important trading partners in the Asia-Pacific region. Thus, any ignorance of the influences of Japan and the US will be misleading in estimating the magnitude of intra-regional trade in the Asia-Pacific area.

7.7 Concluding Remarks

This chapter shows the economic surge of Asia-Pacific region and the possibility to form a currency area in order to stabilize exchange rate shocks within the region. The acceleration of economic growth in the region naturally merges with the idea of mutual cooperation among the Asia-Pacific countries. The outward intra-regional trade, allocation of resources and high degree of complementarity, all foster the process of economic integration and economic cooperation. We construct the real export exchange rates (REER) for the Asia-Pacific countries, including Japan and the United States. Indonesian Rupiah is the base currency and hence REER is expressed as the value of Rupiahs per foreign currency. We prefer export indices to wholesale or consumer price indices, because export indices include the manufacturing goods and the prices of the goods are determined by the international competitive goods markets. Therefore REER reflects a country's export competitiveness in the international markets which is crucial to economic growth.

In order to investigate the trade dependence of Indonesia with other Asia-Pacific countries. A trade independence index is constructed which measures trade interaction of Indonesia and its trading partners in terms of volume and the direction of trade. The index shows that Japan, the US and

Singapore are the three main trading partners with Indonesia. Trade is more intra-regional after Indonesia's trade deregulation in 1986.

Since there is strong tendency for trade dependence in the region, another aspect is to find out whether a system of exchange rates can be converged together to mitigate from external shocks. Therefore, we adopt Cronbach's standardized coefficient alpha (α) to indicate the convergence of exchange rates. We first show the Pearson Coefficient Correlation for the pairs of the countries. The coefficient is ranging from 0.8 to 0.9, indicates a strong and positive correlation between a pair of the countries. Moreover, Cronbach's standardized coefficient alpha (α), also reports that there is strong exchange rate convergence in the Asia-Pacific area. The results possibly indicate the establishment of exchange rate mechanism in the region to project multilateral trade, and to gain cooperation in the area of monetary, fiscal and exchange rate readjustment. The application of Cronbach's standardized coefficient alpha is to measure possible exchange rates cohesion/collaborationin a currency region. The statistics provides a specific value to each group of countries in a discrete time span and thus the results are short-run and static.

However, the existence of real exchange rate persistence will cause asymmetric shock to the mechanism. The validity of Purchasing Power Parity (PPP) is in question because movements of prices and exchange rates are governed by real factors, which are themselves non-stationary. The properties of time series remain an area for investigation. Thus we follow the idea of Enders and Hurn (1994) and test the validity of Generalized Purchasing Power Parity (GPPP). Testing GPPP implies the examination of the time series (real export exchange rates) properties in the long run. GPPP states that bilateral exchange rates governed by real fundamentals are themselves non-stationary. In a GPPP currency area, each REER series is non-stationary but it can share a common stochastic trend within a system of REER. We use Johansen's multivariate cointegration technique to test for the evidence of GPPP. The result shows that there is strong evidence for the presence of cointegrated vectors. It means that common stochastic trends are shared in different economic and political groups. The cointegrated vectors have heavy factor loadings on Singapore and hence the influence of Singapore in the region is significant. Moreover, Johansen's test has the advantage to have the error-correction mechanism, which traces the time path to long run equilibrium relationship. The tests also confirm strong presence of Japan and the US in the Asia-Pacific economies. Co-operative work on exchange rate realignment, monetary and fiscal collaboration among the regional economies definitely heighten economic growth.

The presence of common stochastic trends in the region provides lessons to the Indonesian government. Manufacturing exports are the arteries for economic growth, even though the country has already received considerable revenue from oil-related exports. Further trade and investment liberalization are crucial for foreign direct investment. With country's cheap and large labour force, there will be great potential to industrialize the manufactures. Exchange rate stabilization can render export growth. A decent management on exchange rate is necessary to avoid asymmetric shock, which reduces the competitiveness of export growth. Furthermore, it is true to have stronger role in regional cooperation. Example like the Common Effective Preferential Tariff scheme which aiming at the ASEAN Free Trade Area is essential to boosting cooperation and export and import promotion.

Notes

1. A full set of data in Table 7.2 is not applicable for Hong Kong and Taiwan.

2. In their paper, Enders and Hurn (1994) use wholesale price index to construct the real exchange rate. However, we prefer to use export price index because the index is advantageous to reflect the export competitiveness in the international market among the developing countries. A stable real export exchange rate is crucial to the formation of a currency area.

3. The PACAP Databases is supplied by PACAP Research Center, the University of Rhode Island.

4. Cronbach's standardized coefficient alpha (α) is frequently used in psychological statistics. The principal issue of this statistics can be found in Cronbach (1951).

5. Pearson product-moment correlation coefficient is to measure the direction and the amount of association between two variables. The coefficient is defined as:

$$\rho(X,Y) = \frac{COV(X,Y)}{[VAR(X) \bullet VAR(Y)]^{1/2}}$$

The value of r is large and positive if there is high probability that the large value of X is associated with the large value of Y, and vice versa. For more details, see Gibbons (1985).

6. The literature of PPP can be found in the previous chapter.

7. Examples for the currency basket can be found in Mundell (1961), McKinnon (1963), Branson and Katseli (1982), Moore (1993), Tavlas (1993), Caporale (1993) and von Hagen and Neumann (1994).

8. The theoretical discussion of common trends and common cycles are documented in Stock and Watson (1988), Mellander *et.al.* (1992), Vahid and Engle (1993), Lippi and Reichlin (1994).

9. The representation of common trends and cointegration is taken from Stock and Watson (1988).

10. This implies the series are in random walk processes so that the series do not converge in the long run. The variance of each series is explosive, $t\sigma^2$ and hence the future path of the process increases as the forecasting time span also increases.

11. Johansen's trace statistic for testing H(r) against H(m) is shown as:

$$J_T = -n \sum_{i=r+1}^{m} \log(1 - \hat{\lambda}_r)$$

where $_r$ are the m - r smallest canonical correlations between X_{t-k} and DX_t in Eq. 7.6.

12. The unit root tests are performed by the TSP version 4.3, 1995.

13. For more details about the Weighted Symmetric test can refer to Pantula *et. al.* (1994).

14. The Phillips-Perron test is given in Davidson and MacKinnon (1993) equations (20.17) and (20.18) by the TSP program.

15. Schwert's optimal lag criteria (1987) is formulated as:

Optimal lag = $Int\{4*(T/100)^{1/4}\}$

where T is the total number of observations, and Int is the value of an integer.

Table 7.1 Institutional Initiatives for Economic Cooperation

Phase	Year of Inception	Institution
Phase I	1966	The Pacific Free Trade Area (PAFTA)
Phase II	1967	The Pacific Trade and Development Conference (PAFTAD)
	1967	The Association of South East Asian Nations (ASEAN)
	1967	The Pacific Basin Economic Community (PBEC)
	1979	The Organization for Pacific Trade and Development (OPTAD)
Phase III	1980	The Pacific Economic Cooperation Conference (PECC)
	1989	The Asia-Pacific Economic Cooperation (APEC) forum

Source: Extracted from *Das (1993)*.

Table 7.2 **Sample Means of GDP Growth, Inflation, Investment/GDP and Export/GDP Ratios (1974 - 1991) (percentage)**

Country	Nominal GDP Growth	Real GDP Growth	Inflation Rate	Foreign Direct Investment / GDP	Export / GDP	Exchange Rate Changes
South Korea	23.013	11.360	11.653	0.153	28.784	4.168
Malaysia	11.679	7.164	4.513	3.787	52.318	0.706
Philippines	17.440	2.568	14.872	0.625	17.004	8.847
Singapore	11.742	7.861	3.882	7.469	131.412	-2.222
Thailand	14.527	7.354	7.173	0.938	20.603	1.322
Australia	12.111	2.785	9.327	0.815	13.425	4.197
Canada	9.798	2.539	7.259	0.429	23.377	0.924
Germany	6.082	2.583	3.500	-0.005	24.445	-2.306
Japan	8.082	2.961	5.119	-0.006	10.829	-3.475
Netherlands	6.504	2.178	4.327	-1.809	47.586	-1.895
New Zealand	12.351	0.689	11.664	0.913	22.199	6.270
United Kingdom	12.166	1.939	10.227	-0.729	19.646	2.265
United States	8.395	1.928	6.467	0.001	6.664	-
France	10.514	2.504	8.010	-0.237	17.154	1.499
Indonesia	22.209	9.517	12.693	0.577	25.684	10.178
NIEs[a]	17.377	9.611	7.767	3.811	80.098	0.973
ASEAN[b]	15.519	6.893	8.626	2.679	49.404	3.766
Europe[c]	8.817	2.301	6.516	-0.694	27.208	-0.110
APEC[d]	13.759	5.157	8.602	1.428	32.027	3.092[e]

[a]NIEs are Korea and Singapore.
[b]ASEAN are Malaysia, Philippines, Thailand, Indonesia and Singapore.
[c]Europe are France, United Kingdom, Germany, and Netherlands.
[d]APEC are Japan, Korea, Singapore, Malaysia, Philippines, Thailand, Indonesia, Australia, New Zealand, Canada, and the United States.
[e]excludes the United States.

Source: International Monetary Fund, *IMF CD Rom*, various issues.

Table 7.3 **Standard Deviation of GDP Growth, Inflation, Investment/GDP and Export/GDP Ratios (1974 - 1991)**

Country	Nominal GDP Growth	Real GDP Growth	Inflation Rate	Foreign Direct Investment / GDP	Export / GDP	Exchange Rate Changes
South Korea	8.901	6.549	8.683	0.196	3.284	10.871
Malaysia	8.691	8.139	3.909	1.747	9.238	5.096
Philippines	8.892	6.414	11.690	0.684	2.174	8.847
Singapore	6.560	5.002	5.337	3.362	16.442	4.448
Thailand	5.355	4.798	6.199	0.765	4.124	5.184
Australia	4.582	2.785	3.336	0.745	0.797	9.209
Canada	4.639	3.733	2.920	0.383	1.901	4.471
Germany	1.930	2.637	1.993	0.003	2.785	13.274
Japan	3.705	2.460	5.557	0.004	1.615	13.536
Netherlands	3.530	2.096	3.266	0.668	7.627	13.260
New Zealand	6.207	4.148	4.680	1.267	2.959	12.866
United Kingdom	5.393	3.155	5.929	0.880	1.988	15.027
United States	2.869	3.306	3.315	0.004	0.821	-
France	3.769	1.961	4.097	0.501	1.714	14.468
Indonesia	13.283	7.781	8.306	0.430	2.958	17.050
NIEs[a]	6.241	3.559	6.339	1.672	8.795	5.641
ASEAN[b]	6.949	4.229	5.735	0.964	5.518	6.279
Europe[c]	2.901	1.891	3.539	0.277	3.236	13.031
APEC[d]	4.673	2.556	4.261	0.498	2.717	5.075[e]

[a]NIEs are Korea and Singapore.
[b]ASEAN are Malaysia, Philippines, Thailand, Indonesia and Singapore.
[c]Europe are France, United Kingdom, Germany, and Netherlands.
[d]APEC are Japan, Korea, Singapore, Malaysia, Philippines, Thailand, Indonesia, Australia, New Zealand, Canada, and the United States.
[e]excludes the United States.

Source: International Monetary Fund, *IMF CD Rom*, various issues.

Table 7.4 Trade Dependence Indices of Indonesia and Her Main Trading Partners (percentage)

Partner/Country	1981	1986	1981/86	1991	1986/91	1981/91
Hong Kong	0.238	0.702	+	0.819	+	+
South Korea	0.869	0.823	-	2.966	+	+
Malaysia	0.119	0.211	+	0.656	+	+
Philippines	0.767	0.217	-	0.218	+	-
Singapore	3.948	3.529	-	3.598	+	-
Thailand	0.203	0.248	+	0.477	+	+
Japan	17.067	15.617	-	14.971	-	-
Netherlands	0.635	1.026	+	1.176	+	+
New Zealand	0.342	0.245	-	0.126	-	-
United Kingdom	0.757	0.861	+	1.101	+	+
United States	6.819	7.006	+	6.048	-	-
France	0.322	0.598	+	0.814	+	+
Italy	0.306	0.473	+	0.803	+	+
NIEs[a]	5.054	5.053	-	7.383	+	+
ASEAN[b]	5.035	4.205	-	4.949	+	-

[a]NIEs are Hong Kong, Korea and Singapore.
[b]ASEAN are Malaysia, Philippines, Thailand and Singapore.
"+" indicates a positive change and "-" indicates a negative change.

Source: International Monetary Fund, *Direction of Trade*, and various issues.

Table 7.5 Pearson Correlation Coefficients, (1975:1 - 1991:4)

	Hong Kong	South Korea	Malaysia	Philippines	Singapore	Thailand	Indonesia	Japan	U.S.
Hong Kong	1.000	0.967	0.897	0.756	0.945	0.960	0.780	0.975	0.949
South Korea	0.967	1.000	0.962	0.649	0.995	0.997	0.896	0.996	0.996
Malaysia	0.897	0.962	1.000	0.608	0.972	0.961	0.920	0.950	0.962
Philippines	0.756	0.649	0.608	1.000	0.603	0.636	0.342	0.670	0.606
Singapore	0.945	0.995	0.972	0.603	1.000	0.997	0.923	0.989	0.997
Thailand	0.960	0.997	0.961	0.636	0.997	1.000	0.902	0.994	0.996
Indonesia	0.780	0.896	0.920	0.342	0.923	0.902	1.000	0.878	0.911
Japan	0.975	0.996	0.950	0.670	0.989	0.994	0.878	1.000	0.992
U.S.	0.949	0.996	0.962	0.606	0.997	0.996	0.911	0.992	1.000

Table 7.6 Cronbach's Standardised Coefficient Alpha, α

Groups	$\Sigma\Sigma\ \rho_{mn}$	r	α
NIEs	2.907	0.969	0.969
ASEAN	7.864	0.786	0.948
NIEs + ASEAN	17.668	0.841	0.974
NIEs + ASEAN + JAP	24.120	0.861	0.980
NIEs + ASEAN + U.S.	24.085	0.860	0.980

[a]NIEs are Hong Kong, Korea and Singapore.
[b]ASEAN are Malaysia, Philippines, Thailand and Singapore.

Cronbach's standardised coefficient alpha, (α) is computed as:

$$\alpha = \frac{qr}{1 + (q-1)r}$$

and

$$r = \frac{2}{q(q-1)} \sum_{all\ m,n}^{q} \sum_{m<n}^{q} \rho_{mn}$$

where r is the average value of Pearson correlation coefficient; ρ_{mn}, of the different pairs of two countries, m and n and q is the number of the countries (see Green, 1994).

Table 7.7 Unit Root Tests of the Real Export Exchange Rate (Level)

Country	Weighted Symmetric	Dickey-Fuller	Phillips-Perron
Hong Kong	-1.629 (0.848)	-1.545 (0.813)	-6.342 (0.718)
South Korea	-1.815 (0.762)	-1.883 (0.663)	-7.694 (0.608)
Malaysia	-2.619 (0.225)	-2.556 (0.301)	-18.010 (0.105)
Philippines	-2.232 (0.480)	-2.309 (0.429)	-14.147 (0.217)
Singapore	-1.834 (0.752)	-2.161 (0.512)	-11.115 (0.366)
Thailand	-1.821 (0.759)	-2.076 (0.600)	-9.365 (0.480)
Taiwan	-2.083 (0.590)	-1.862 (0.674)	-10.026 (0.434)
Japan	-1.636 (0.846)	-1.881 (0.664)	-6.958 (0.668)
United States	-1.769 (0.786)	-2.110 (0.540)	-9.029 (0.505)

Table 7.8 Unit Root Tests of the Real Export Exchange Rate (First Difference)

Country	Weighted Symmetric	Dickey-Fuller	Phillips-Perron
Hong Kong	-5.655 (0.000)	-5.446 (0.000)	-70.864 (0.000)
South Korea	-5.098 (0.000)	-4.900 (0.000)	-69.135 (0.000)
Malaysia	-4.876 (0.000)	-4.991 (0.000)	-78.838 (0.000)
Philippines	-5.232 (0.000)	-5.230 (0.000)	-65.526 (0.000)
Singapore	-5.647 (0.000)	-5.429 (0.000)	-75.259 (0.000)
Thailand	-5.567 (0.000)	-5.372 (0.000)	-71.202 (0.000)
Taiwan	-4.829 (0.000)	-4.754 (0.001)	-63.811 (0.000)
Japan	-5.007 (0.000)	-4.794 (0.000)	-72.751 (0.000)
United States	-5.458 (0.000)	-5.246 (0.000)	-69.221 (0.000)

Note: The optimal lag length is 2, which is described in Pantula *et. al.* (1994).
The parenthesis indicates asymptotic P-value at 5% level..

Table 7.9 Johansen's Trace Statistics of NIEs

64 observations from 1976Q1 to 1991Q4

Country specified:

Hong Kong, South Korea, Singapore and Taiwan

Null	Alternative	Trace Statistics	95% Critical Value
$r = 0$	$r \geq 1$	59.033*	47.210
$r \leq 1$	$r \geq 2$	15.134	29.680
$r \leq 2$	$r \geq 3$	7.668	15.410
$r \leq 3$	$r = 4$	2.016	3.762

Normalized Cointegrated Vector β ($r = 1$)

Hong Kong	-1.0000
South Korea	-1.1362
Singapore	3.4808
Taiwan	-1.3512

Normalized Adjustment Speed α ($r = 1$)

Hong Kong	-0.2873
South Korea	-0.3762
Singapore	-0.4089
Taiwan	-0.0064

Note: Critical values are tabulated in Osterwald-Lenum (1990). "*" indicates 5% significance.

Table 7.10 Johansen's Trace Statistics of ASEAN

64 observations from 1976Q1 to 1991Q4

Country specified:

Malaysia, Philippines, Singapore and Thailand

Null	Alternative	Trace Statistics	95% Critical Value
$r = 0$	$r \geq 1$	63.810*	47.210
$r \leq 1$	$r \geq 2$	36.052*	29.680
$r \leq 2$	$r \geq 3$	13.430	15.410
$r \leq 3$	$r = 4$	0.149	3.762

Normalized Cointegrated Vector β ($r = 2$)

	Vector 1	Vector 2
Malaysia	-1.0000	-1.0000
Philippines	0.5346	0.6003
Singapore	5.4881	1.6514
Thailand	-4.7242	-1.0822

Normalized Adjustment Speed α ($r = 2$)

	Vector 1	Vector 2
Malaysia	-0.1658	-0.1056
Philippines	-0.1719	-0.1174
Singapore	-0.1461	-0.3041
Thailand	-0.0274	-0.2879

Note: see Table 7.9.

Table 7.11 Johansen's Trace Statistics of NIEs and ASEAN

64 observations from 1976Q1 to 1991Q4

Country specified:

Hong Kong, South Korea, Singapore, Taiwan, Malaysia, Philippines and Thailand

Null	Alternative	Trace Statistics	95% Critical Value
$r = 0$	$r \geq 1$	191.534*	124.243
$r \leq 1$	$r \geq 2$	110.228*	94.155
$r \leq 2$	$r \geq 3$	73.493*	68.524
$r \leq 3$	$r \geq 4$	45.476	47.210
$r \leq 4$	$r \geq 5$	26.113	29.680
$r \leq 5$	$r \geq 6$	11.640	15.410
$r \leq 6$	$r = 7$	4.777	3.762

Normalized Cointegrated Vector β ($r = 3$)

	Vector 1	Vector 2	Vector 3
Hong Kong	-1.0000	-1.0000	-1.0000
South Korea	-1.0826	4.0916	-0.0579
Singapore	3.5385	4.7859	-2.0718
Taiwan	-0.5848	-0.4711	0.2623
Malaysia	-0.4115	-1.0056	0.0824
Philippines	0.9275	-0.8647	0.3091
Thailand	-0.8364	-6.9664	2.4578

Normalized Adjustment Speed α ($r = 3$)

	Vector 1	Vector 2	Vector 3
Hong Kong	-0.7284	0.1605	0.0745
South Korea	-0.8491	0.1230	0.1110
Singapore	-0.8474	0.8677	0.1273
Taiwan	-0.0718	0.0237	-0.0985
Malaysia	-0.7692	0.0634	0.0586
Philippines	-0.9204	0.0616	-0.1879
Thailand	-0.8477	0.1476	0.0562

Note: see Table 7.9.

Table 7.12 Johansen's Trace Statistics of NIEs and Japan

64 observations from 1976Q1 to 1991Q4

Country specified:

Hong Kong, South Korea, Singapore, Taiwan and Japan

Null	Alternative	Trace Statistics	95% Critical Value
$r = 0$	$r \geq 1$	88.438*	68.524
$r \leq 1$	$r \geq 2$	35.101	47.210
$r \leq 2$	$r \geq 3$	17.360	29.680
$r \leq 3$	$r \geq 4$	8.141	15.410
$r \leq 4$	$r = 5$	2.350	3.762

Normalized Cointegrated Vector β ($r = 1$)

Hong Kong	-1.0000
South Korea	-4.1158
Singapore	8.4728
Taiwan	-2.3381
Japan	-0.4669

Normalized Adjustment Speed α ($r = 1$)

Hong Kong	-0.1246
South Korea	-0.1639
Singapore	-0.1948
Taiwan	0.0017
Japan	-0.1594

Hypothesis Testing (H_0: coefficient of Japan is zero) $\chi^2(1) = 0.10814$ (0.742)

Note: see Table 7.9.

Table 7.13 Johansen's Trace Statistics of ASEAN and Japan

64 observations from 1976Q1 to 1991Q4

Country specified:

Singapore, Philippines, Thailand, Malaysia, and Japan

Null	Alternative	Trace Statistics	95% Critical Value
$r = 0$	$r \geq 1$	112.027*	68.524
$r \leq 1$	$r \geq 2$	61.633*	47.210
$r \leq 2$	$r \geq 3$	33.316*	29.680
$r \leq 3$	$r \geq 4$	10.548	15.410
$r \leq 4$	$r = 5$	0.038	3.762

Normalized Cointegrated Vector β ($r = 3$)

	Vector 1	Vector 2	Vector 3
Singapore	-1.0000	-1.0000	-1.0000
Philippines	-0.4698	-0.0340	-4.9501
Thailand	0.3594	1.0067	-44.6902
Malaysia	-0.2112	0.1903	-51.3010
Japan	0.5250	-0.1527	73.3309

Normalized Adjustment Speed α ($r = 3$)

	Vector 1	Vector 2	Vector 3
Singapore	2.1392	0.2942	0.0050
Philippines	2.5434	0.0580	0.0046
Thailand	2.1117	-0.3119	0.0091
Malaysia	1.6928	0.4256	0.0026
Japan	-2.8888	-0.1863	0.0019

Hypothesis Testing (H_0: coefficient of Japan is zero) $\chi^2(3) = 26.6575$ (0.000)

Note: see Table 7.9.

Table 7.14 Johansen's Trace Statistics of NIEs, ASEAN and Japan

64 observations from 1976Q1 to 1991Q4

Country specified:

Hong Kong, South Korea, Singapore, Taiwan, Philippines, Thailand, Malaysia and Japan

Null	Alternative	Trace Statistics	95% Critical Value
$r=0$	$r\geq 1$	248.876*	155.999
$r\leq 1$	$r\geq 2$	158.111*	124.243
$r\leq 2$	$r\geq 3$	107.235*	94.155
$r\leq 3$	$r\geq 4$	75.066*	68.524
$r\leq 4$	$r\geq 5$	48.222*	47.210
$r\leq 5$	$r\geq 6$	23.894	29.680
$r\leq 6$	$r\geq 7$	11.084	15.410
$r\leq 7$	$r=8$	4.424	3.762

Normalized Cointegrated Vector β ($r=5$)

	Vector 1	Vector 2	Vector 3	Vector 4	Vector 5
Hong Kong	-1.000	-1.000	-1.000	-1.000	-1.000
South Korea	-1.124	-0.265	-11.840	0.763	-2.348
Singapore	10.087	1.029	-46.797	0.880	-2.016
Taiwan	-1.261	-1.045	3.997	0.392	-0.015
Philippines	3.207	-2.308	7.610	0.715	-0.240
Thailand	-2.334	-1.622	84.555	-1.438	2.955
Malaysia	-1.011	0.510	22.791	-1.080	-0.224
Japan	-3.886	2.667	-41.863	0.659	2.329

Normalized Adjustment Speed α ($r=5$)

	Vector 1	Vector 2	Vector 3	Vector 4	Vector 5
Hong Kong	-0.310	0.068	-0.001	0.237	-0.076
South Korea	-0.369	0.037	-0.010	0.254	0.034
Singapore	-0.376	-0.004	0.005	0.191	-0.020
Taiwan	0.018	0.019	-0.010	-0.199	-0.150
Philippines	-0.386	-0.018	-0.008	0.011	-0.047
Thailand	-0.369	0.041	-0.003	0.301	-0.073
Malaysia	-0.310	-0.053	-0.003	0.226	0.065
Japan	-0.412	0.118	-0.005	0.139	-0.043

Hypothesis Testing (H_0: coefficient of Japan is zero) $\chi^2(5) = 32.6367$ (0.000)

Note: see Table 7.9.

Table 7.15 Johansen's Trace Statistics of NIEs and US

64 observations from 1976Q1 to 1991Q4

Country specified:

Hong Kong, South Korea, Singapore, Taiwan and US

Null	Alternative	Trace Statistics	95% Critical Value
$r = 0$	$r \geq 1$	103.285*	68.524
$r \leq 1$	$r \geq 2$	50.639*	47.210
$r \leq 2$	$r \geq 3$	21.007	29.680
$r \leq 3$	$r \geq 4$	7.765	15.410
$r \leq 4$	$r = 5$	1.356	3.762

Normalized Cointegrated Vector β ($r = 2$)

	Vector 1	Vector 2
Hong Kong	-1.0000	-1.0000
South Korea	-0.0021	1.8552
Singapore	3.4466	3.1342
Taiwan	-1.1177	0.3962
US	-1.3620	-4.4917

Normalized Adjustment Speed α ($r = 2$)

	Vector 1	Vector 2
Hong Kong	-0.4642	0.0097
South Korea	-0.6096	0.0062
Singapore	-0.6146	-0.0421
Taiwan	0.0203	-0.0979
US	-0.6028	0.0404

Hypothesis Testing (H_0: coefficient of US is zero) $\chi^2(2) = 15.6648$ (0.000)

Note: see Table 7.9.

Table 7.16 Johansen's Trace Statistics of ASEAN and US

64 observations from 1976Q1 to 1991Q4

Country specified:

Malaysia, Philippines, Thailand, Singapore and US

Null	Alternative	Trace Statistics	95% Critical Value
$r=0$	$r\geq 1$	75.168*	68.524
$r\leq 1$	$r\geq 2$	42.022	47.210
$r\leq 2$	$r\geq 3$	20.002	29.680
$r\leq 3$	$r\geq 4$	7.185	15.410
$r\leq 4$	$r=5$	0.086	3.762

Normalized Cointegrated Vector β ($r=1$)

Malaysia	-1.0000
Philippines	0.2125
Thailand	-5.9418
Singapore	6.1028
US	-0.6341

Normalized Adjustment Speed α ($r=1$)

Malaysia	0.0035
Philippines	0.0019
Thailand	0.1155
Singapore	0.0276
US	0.0934

Hypothesis Testing (H_0: coefficient of US is zero) $\chi^2(1) = 0.61719\ (0.432)$

Note: see Table 7.9.

Table 7.17 Johansen's Trace Statistics of NIEs, ASEAN and US

64 observations from 1976Q1 to 1991Q4

Country specified:

Malaysia, Philippines, Thailand, Singapore, Taiwan, South Korea, Hong Kong and US

Null	Alternative	Trace Statistics	95% Critical Value
$r = 0$	$r \geq 1$	263.637*	155.999
$r \leq 1$	$r \geq 2$	171.473*	124.243
$r \leq 2$	$r \geq 3$	108.116*	94.155
$r \leq 3$	$r \geq 4$	66.587	68.524
$r \leq 4$	$r \geq 5$	42.048	47.210
$r \leq 5$	$r \geq 6$	22.023	29.680
$r \leq 6$	$r \geq 7$	9.384	15.410
$r \leq 7$	$r = 1$	1.357	3.762

Normalized Cointegrated Vector β ($r = 3$)

	Vector 1	Vector 2	Vector 3
Malaysia	-1.0000	-1.0000	-1.0000
Philippines	2.8127	-0.0695	-0.1265
Thailand	-2.2796	-3.3912	-4.0576
Singapore	11.9746	6.9072	1.7473
Taiwan	-2.3095	-0.1518	-0.1566
South Korea	-3.3964	5.3717	0.5366
Hong Kong	-2.9045	-2.4221	-0.1530
US	-0.9129	-6.3350	2.7003

Normalized Adjustment Speed α ($r = 3$)

	Vector 1	Vector 2	Vector 3
Malaysia	-0.2421	-0.0703	0.1146
Philippines	-0.2756	0.0219	0.0541
Thailand	-0.2586	-0.0438	0.2079
Singapore	-0.2556	-0.0734	0.1195
Taiwan	-0.0219	0.0211	-0.0021
South Korea	-0.2671	-0.0215	0.1640
Hong Kong	-0.2253	0.0075	0.2074
US	-0.2664	0.0149	0.1594

Hypothesis Testing (H_0: coefficient of US is zero) $\chi^2(3) = 36.1664\ (0.000)$

Note: see Table 7.9.

Fig. 7.1 Hong Kong Real Export Exchange Rate (log)

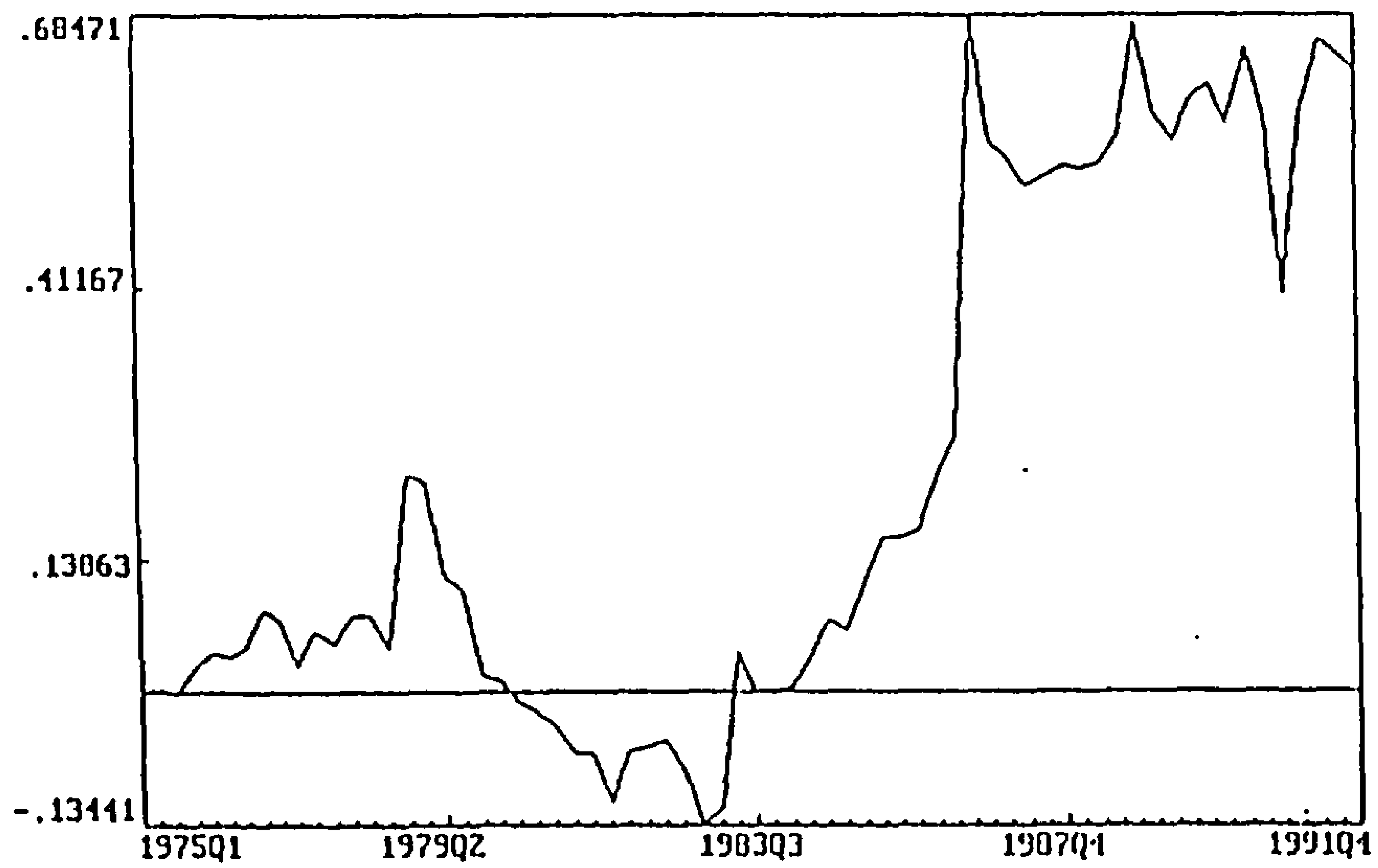


Fig. 7.3 Malaysia Real Export Exchange Rate (log)

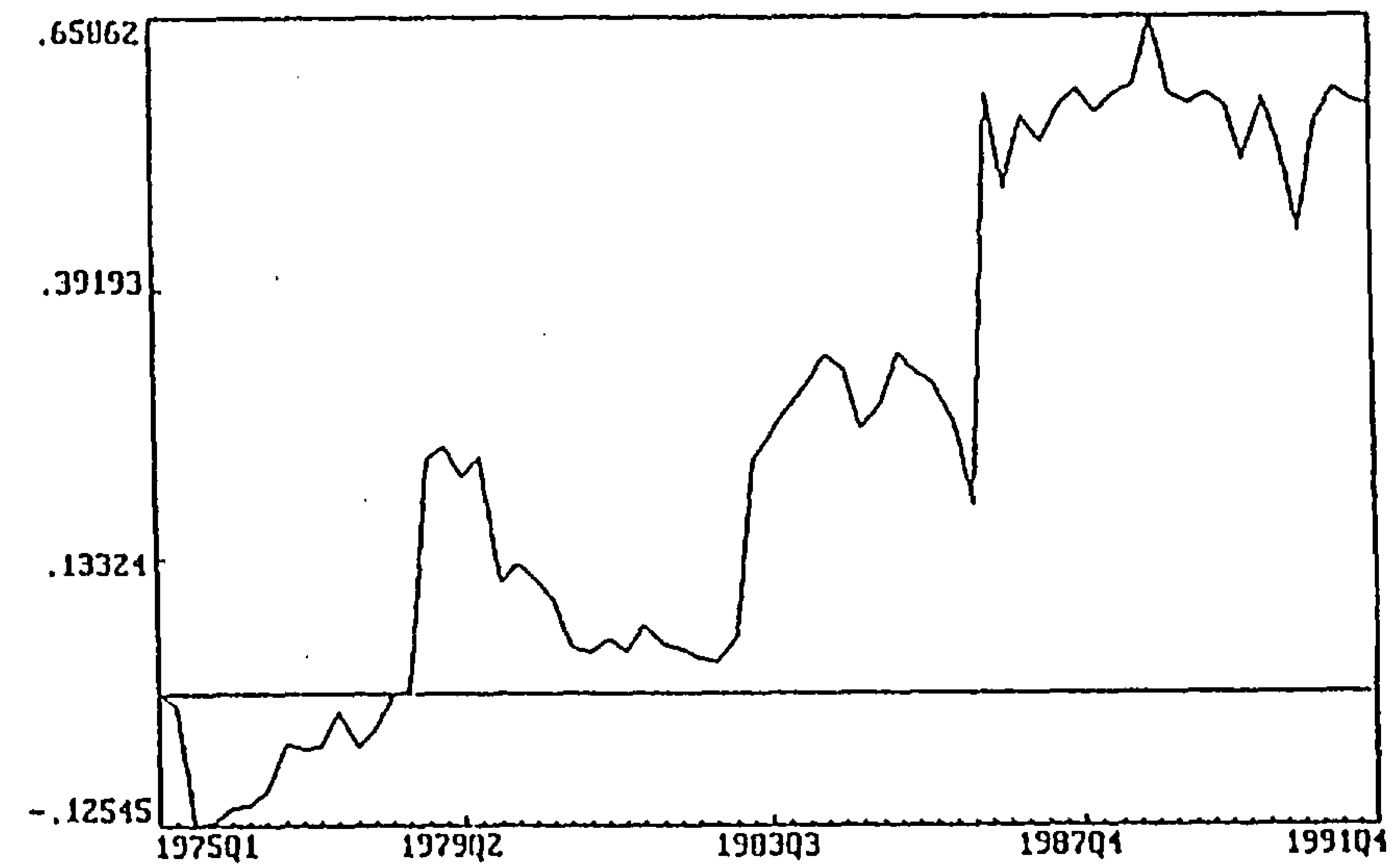


Fig. 7.2 Korea Real Export Exchange Rate (log)

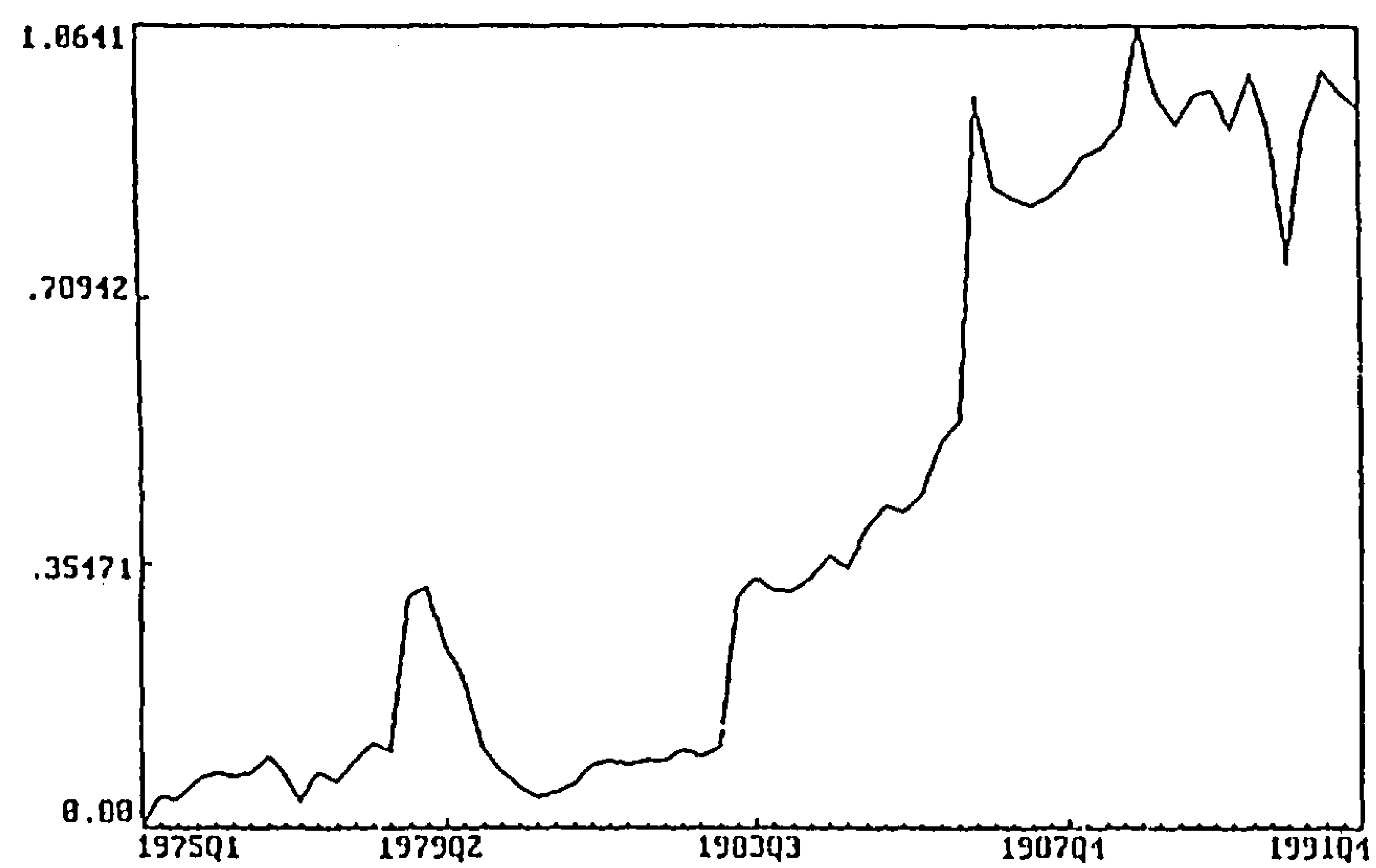


Fig. 7.4 Philippines Real Export Exchange Rate (log)

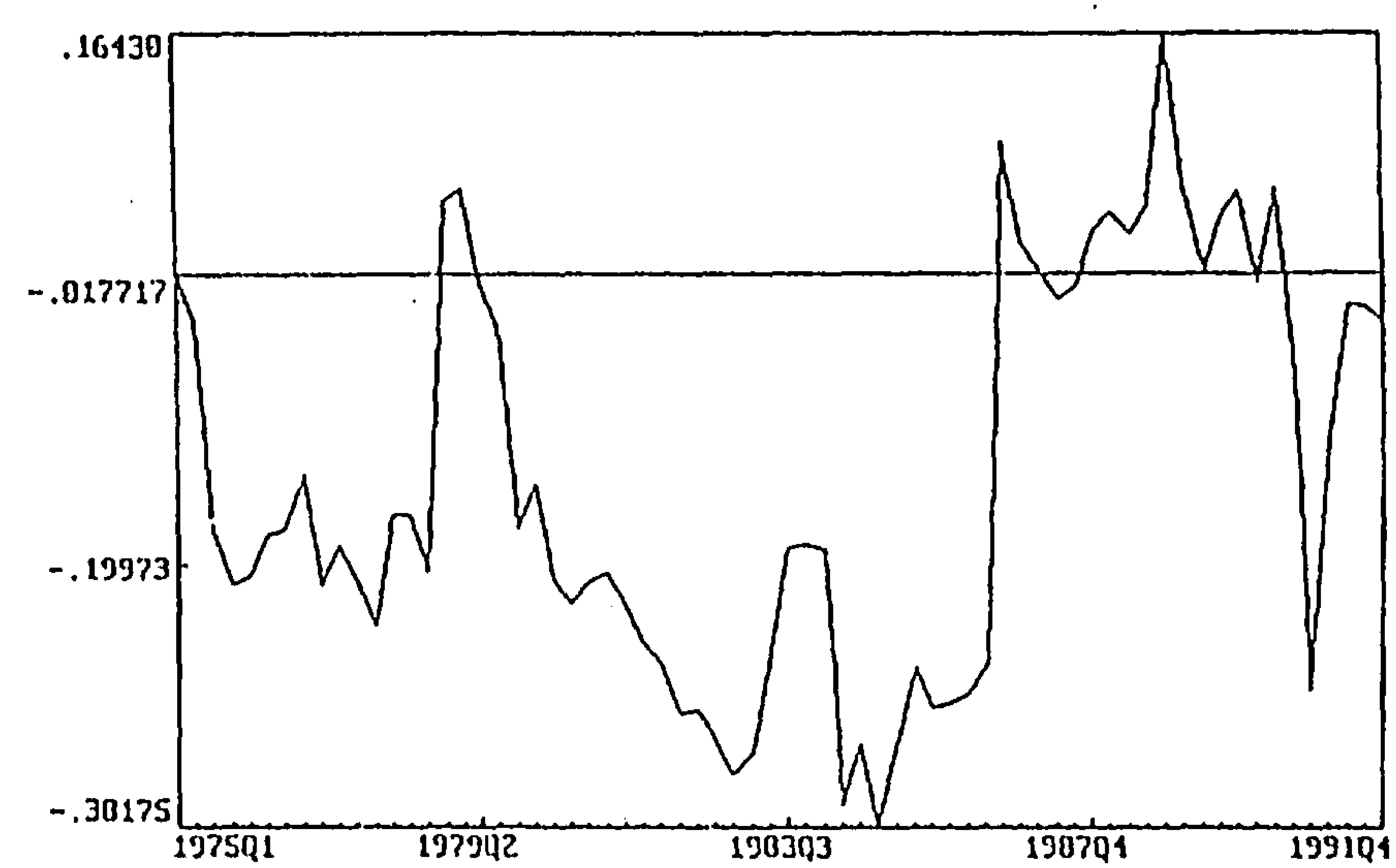


Fig. 7.5 Singapore Real Export Exchange Rate (log)

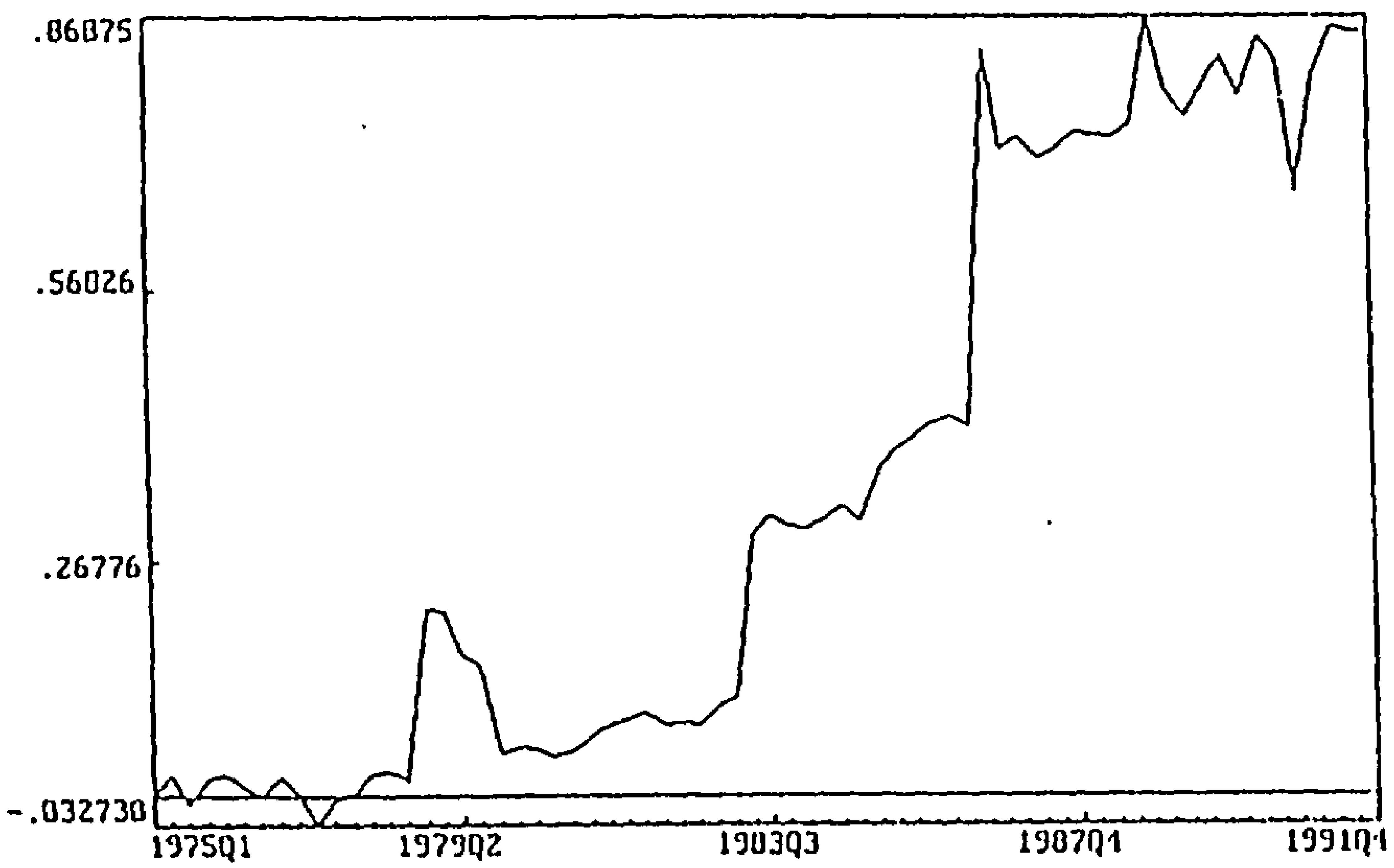


Fig. 7.7 Taiwan Real Export Exchange Rate (log)

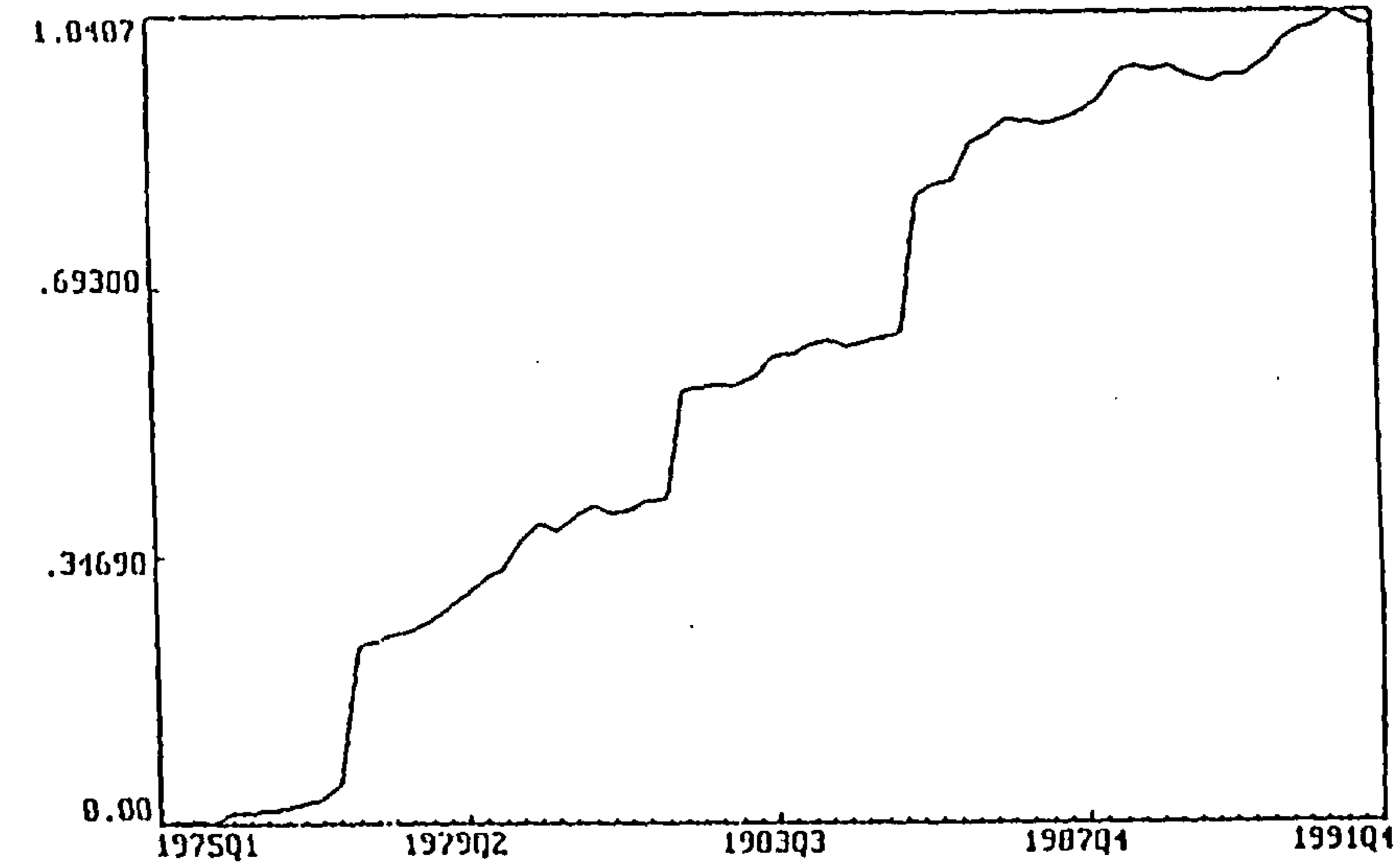


Fig. 7.6 Thailand Real Export Exchange Rate (log)

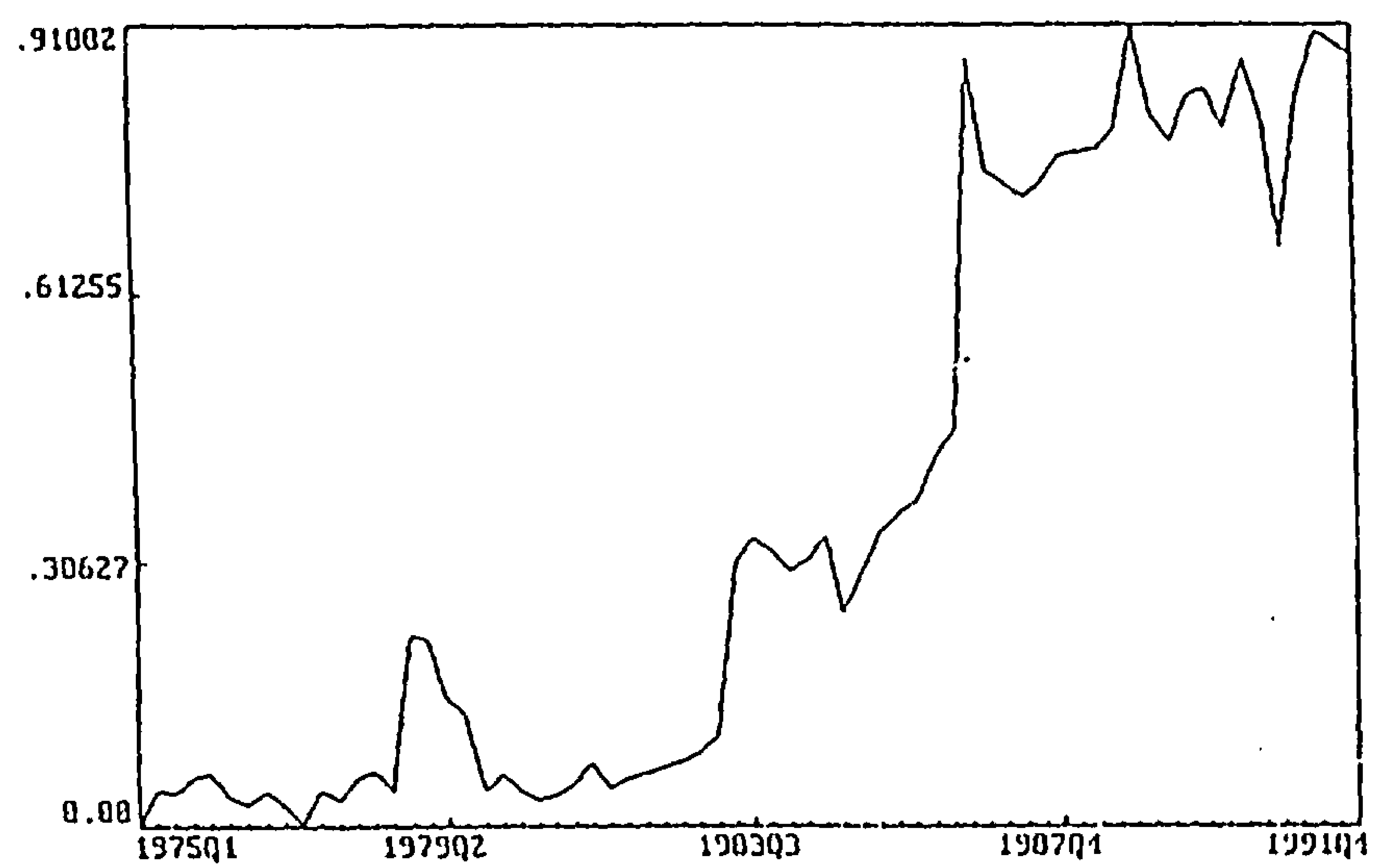


Fig. 7.8 Japan Real Export Exchange Rate (log)

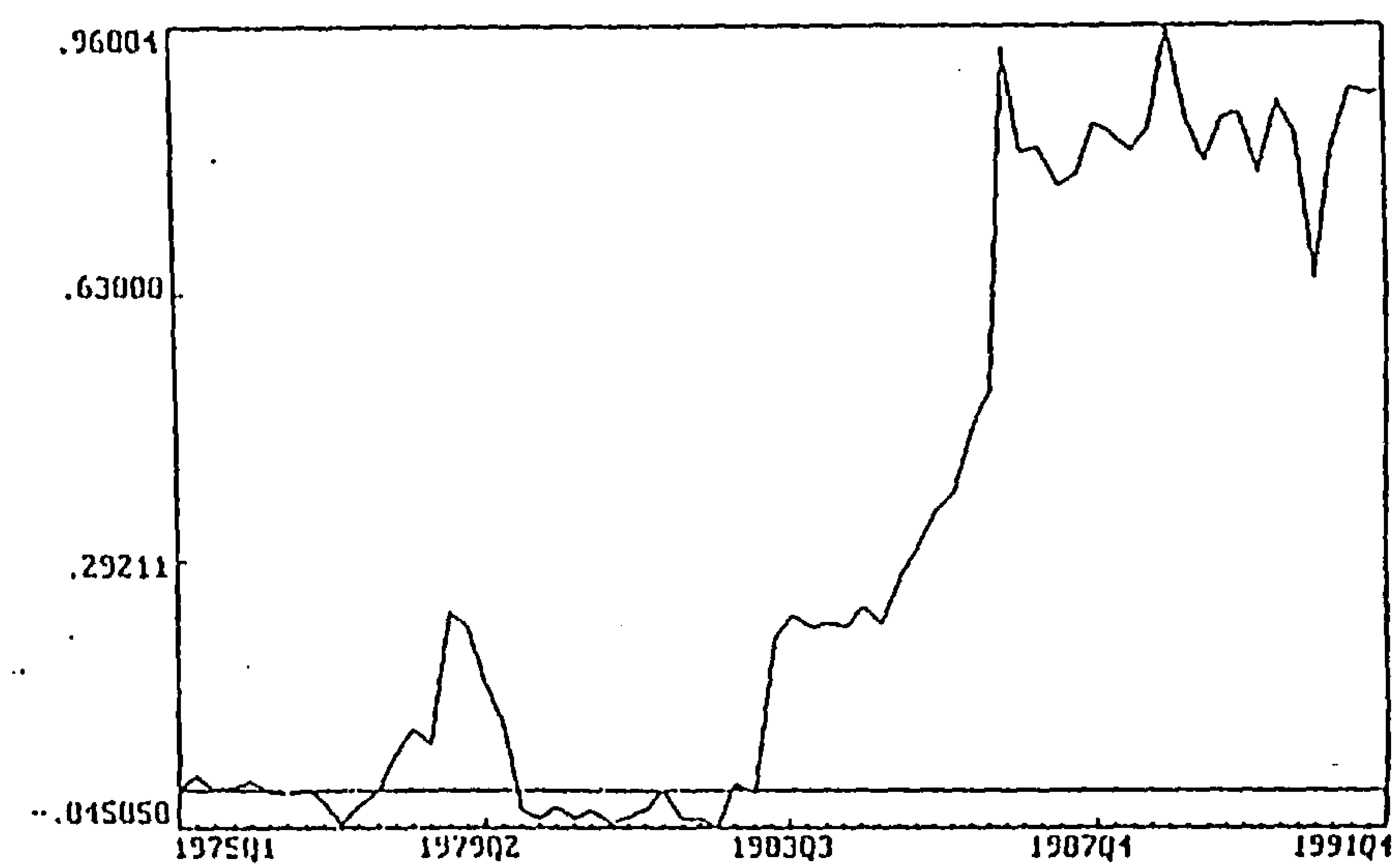
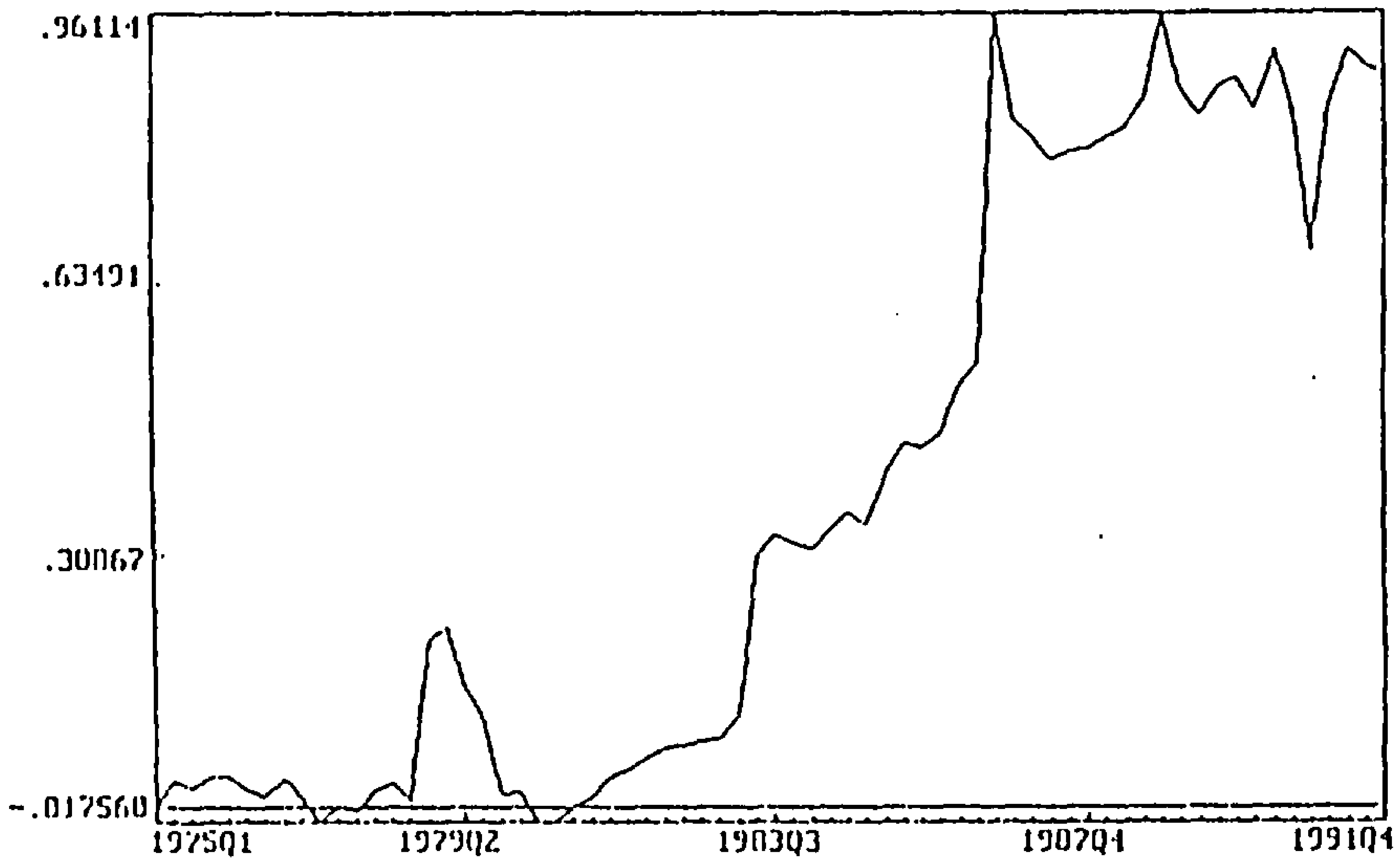


Fig. 7.9 US Real Export Exchange Rate (log)



Chapter 8 Conclusion

The political and economic uncertainties have been largely multiplied by the economic crisis that began in East Asia in 1997, first in Thailand, then contagiously in the other Asian countries and in Indonesia of course, with no exception. In this study Indonesia's economic policies are evaluated before the occurrence of economic crisis. In particular, the thesis attempts to examine using a systematic approach the relationship between export and growth on the hand, and export trade and the real exchange rate on the other hand during the period 1974-1993. The rapid economic growth of Indonesia in those years has enabled us to draw critical conclusions of how a successful economic model can be applied to a small open developing economy.

Indonesia's strong economic performance was reflected by a series of market-oriented reform programmes. More than a dozen major policy reform packages have been introduced since 1983. Trade and industrial reforms facilitated an export-oriented environment for economic growth. The import-substitution policy to trade was shifted to export-promoting approach. There was no doubt that liberalization of many regulations related to trade, industrial and investment policies were favoured to the growth of manufactured exports.

The role of export growth in the economic development is the first topic that we examined. Export growth may contribute to a country's output growth. With trade liberalization in the mid-eighties, strong export performance was widely believed to be the main contributor to Indonesia's high economic growth. This engine of growth leads to the central research of the export-led growth hypothesis. The high export growth of the newly industrializing Asian economies rekindles the debate of export-led growth hypothesis and sharpens the search for the growth strategy in a country. Two recent developments are added to the export-growth studies. Firstly, the determinants of export growth and its validity of the assumptions in the role of growth process. Secondly, the introduction of causality and cointegration in the applied econometric research on the export-growth linkage.

Two export growth models are discussed in the explanation of the export determinants: Thrillwall's balance of payment constrained growth model and the expanded neoclassical model. Thrillwall's model states that in the long run, a country's growth rate of real income is equal to the real income rate, which is consistent with current account balance. The model is tested by applying Johansen's cointegration technique. The overall results are in favour of one cointegration relationship in different sample periods. It is shown that in the long run real exports and real income are expected to move together over time. The model also shows that different sample periods are insensitive to different results. Devaluation in the mid-eighties did not alternate the co-movement feature of real exports and income in the long run. It also implies that the validity of purchasing-power parity (PPP) in the Thrillwall's balance of payment constrained growth equation (The validity of PPP will be further discussed later). The simple policy conclusion is that if the government wish to grow faster they must first raise the balance-of-payments constraint on demand. If the balance-of-payments equilibrium growth rate can be raised by making exports more attractive and by reducing the income elasticity of demand for imports, demand can be expanded without producing balance-of-payments difficulties. The result is echoed by Van Der Meulen Rodgers (1996) that the non-oil export growth constitutes the most significant aspect of Indonesia's trade experience in the 1980s. Diversification of both export products and markets allowed Indonesia to gain more stable foreign exchange earnings to finance external debt and import payments (p.164).

The neoclassical model is relaxed by including the unconventional variables such as investment-to-income ratio, government expenditure, labour force, non-exports, imports and real exchange rate. The final export-growth equations are then determined by the general-to-specific approach. The empirical result confirms that those unconventional variables are statistically significant in modeling the size of output growth.

The above mentioned two models affirm that there is a positive linkage between export performance and economic growth in Indonesia, though the study does not offer generalized and indicative of trends for other developing countries. The growth of non-oil exports, particularly in the labour-intensive light industries, helps create large employment opportunities in Indonesia between 1980-1990. It is especially relevant to Indonesia, as its population is the fourth largest in the world. The ability to mobilize rural workforce and large population can minimize regional economic imparities. The future policy to expand export growth would depend on the improvement of labour training and education, the ability for technological catch-up and the shifting into higher value added activities.

Another related issue is the validity of export-led hypothesis. New developments in applied econometrics, such as the time series concept of cointegration and causality tests are applied to capture the causation of export and output growth. Indonesia was traditionally an oil export country, the growth of non-oil exports in the eighties, however, became a driving force in economic growth. It is interesting to investigate whether higher non-oil export growth triggers higher output growth, or the output growth is still depending on the expansion of the oil sector. The causation relationship is divided into two parts: 1) real non-oil export sector and real economic growth and 2) real oil export sector and real economic growth. The empirical results show that there is a long run cointegration relationship between non-oil real exports and economic growth. A bidirectional causation is found in these variables. This implies that a two-way causality test do not support the export-led hypothesis in the Indonesia's non-oil export sector. For the oil exports, it is only the real oil export growth Granger-cause the real output growth (with quarterly data). The export-led growth, defined as a unidirectional causation from exports to output, is only valid in the Indonesia's oil export industry.

The empirical results show that the deregulation-cum-devaluation policies in the 1980s fostered non-oil export growth and much of the foreign earnings were generated from the manufactured exports. It was the decade that massive foreign capital investment was flown into the domestic market. The flow could have increased employment opportunities and accelerated Indonesia's transformation from labour-incentive to capital-incentive industries. A series of trade liberalization led to the development of financial system. On the other hand, the study also reaffirms the importance of oil exports to Indonesia's economic growth. Stable oil pricing and exchange rate policies provide considerable government revenue. That makes Indonesia an outward-oriented with resource-based exporting country.

Where a country's policy emphasises export growth, one of the major issues is to ensure a stable exchange rate. If trade reforms require a supportive macroeconomic environment, minimizing disturbances of macroeconomic variables should enhance steady export growth. Indonesia's devaluation policy in the eighties was to improve the country's export competitiveness; one of the government's policies was to maintain real exchange rate stability in order to smooth out export fluctuation. The real exchange rate volatility might be detrimental to export trade. A trade-weighted export aggregate demand function including real exchange rate volatility, relative export prices and foreign income is tested. A moving average of real exchange rate volatility is calculated as a proxy for measuring exchange rate uncertainty. We apply the long-run cointegrated VAR approach to investigate the effect of real exchange rate volatility on Indonesia's export sector. The magnitude of export fluctuation is measured via generalized impulse response function and generalized forecast error variance decomposition. The error-correction (ECM) model and Wu-Hausman exogeneity test are used to investigate short-run dynamic export function and the exogeneity of volatility in the VECM model. Furthermore, four individual export demand functions of Indonesia's main export partners are also analysed.

The empirical results confirm that the real exchange rate volatility exhibits negative relationship to Indonesia's export sector. The model shows that volatility is the main reason for export uncertainty. The government should establish a stable exchange rate policy to ensure export growth. It has been argued that an excessive degree of exchange rate volatility usually creates pressure to protect some industries, which are vulnerable to international competitiveness. This phenomenon may not be confined to Indonesia. The persistent exchange rate volatility might have possibly led to protectionist pressures on Indonesia's trading partners, especially the regional economies that have been undergone different degrees of trade and investment reforms in the past decades. Moreover, exchange rate volatility can increase firms' exposure to exchange risk if their debt is denominated in foreign currencies. The volatility may potentially shift the pattern of domestic investment and output in terms of shifting resources in the production of non-trade goods over traded goods, or leading to over-concentration of some industries due to comparative advantage or geographical proximity. The effects would definitely hamper the volume of export trade and the pattern of international trade.

Understanding the properties and movement of the real exchange rate is crucial for the Indonesian government to maintain exchange rate stability that is essential to export and economic growth. Exchange rate volatility may force the authorities' reaction to reconsider the operation of trade policies, and at the same time, consequential inflation may hold back the sustainability of trade and output growth. Indonesia has experienced high inflation and currency devaluation in the 1980s. The changes of real exchange rate would directly link to the movement of relative prices. It is essential to understand the movement of the exchange rate within the framework of purchasing power parity (PPP). And a comprehensive study on the Indonesia's real exchange rate is therefore discussed.

The trade-weighted effective exchange rate indices are established. By employing multivariate cointegration techniques, the empirical results find evidence in favour of long run PPP in the unrestricted equations.

Additional examination for the properties of PPP is carried out. Three hypothesis are tested, namely, symmetry and proportionality; structural break test and variance ratio test on the persistence of random walk. The overall results show that the effective exchange rates prove strong evidence of symmetry and proportionality properties of PPP. On the other hand, it is true that the effective exchange rates are non-stationary, driven by random walk component, which is very persistence. Applying Perron's break point procedure cannot reject the unit root hypothesis. The persistence of the random walk component is strong in the earlier lags, ranging from 8 to 17 quarters to the half size of the series.

For the policy implication, the stochastic process mainly drives the exchange rate changes. Devaluations increased the fluctuation of the series and the reversal to long run equilibrium of PPP is impossible in a short time span. Exchange rate uncertainty in the short run serves to emphasise on the importance of Indonesian government to increase the adaptability of their economies and the resilience to unpredictable shocks. On the other hand, devaluations in the mid-eighties helped increase the volume of non-oil exports through a series of trade liberalization. Appropriate devaluation-cum-monetarypolicies could reduce shocks from exchange rate fluctuation, and restore the co-movement of exchange rates and relative prices over the long run equilibrium.

If a stable nominal exchange rate contributes to export growth, a linked stable exchange rate mechanism can foster intra-regional trade and build up mutual export-trade relationships. The general reduction in trade barrier and the removal of capital flow restrictions have resulted in highly integrated trade and financial flows in the international market. Persistent trade imbalances and fluctuation of exchange rates may cause the possibility of exchange rate policy coordination among trading partners. Hence a policy of stable exchange rates can internalize the spill-over effects and the externalities derived from those trading partners that pursue independent monetary policies in a region. Higher trade dependence would link to mutual exchange rate adjustments, leading to lesser exchange rate variability and fostering export growth. The acceleration of economic growth in the region naturally merges with the idea of mutual cooperation among the Asian Pacific countries. The outward intra-regional trade, allocation of resources and high degree of complementarity, all foster the process of economic integration and economic cooperation.

In a discrete time span, trade independence index and Cronbach's standardized coefficient alpha are constructed to measure the trade dependence of Indonesia's main trading partners and the convergence of their real export exchange rates respectively. The statistics shows the possibility to establish a closer exchange rate co-ordination inter-regionally. Further step to focus on the convergence issue and the long-run exchange rate stabilization of Indonesia's regional trading partners is to test the Generalized PPP, an idea developed by Enders and Hurn. It is an analysis to identify a possible currency area by testing PPP in a multi-country setting through the application of Johansen cointegration technique. In a GPPP currency area, each real export change rate (REER) series is non-stationary but it can share a common stochastic trend within a system of REER. The result shows that there is strong evidence for the presence of cointegrated vectors. It means that common stochastic trends are shared in different economic and political groups. The cointegrated vectors have heavy factor loadings on Singapore and the inclusion of Japan and the US economic influence in the region is significant.

The favour of GPPP does not imply a necessary and sufficient condition for the East Asian countries to form a currency area. A good management of exchange rates and closer co-ordination amongst Indonesia's main trading partners would reduce asymmetric shocks that lead to the international competitiveness and export growth. It is fair to say to focus on the long-run stability properties of real exchange rates within the regional countries. For Indonesia, manufactured exports are the arteries for economic growth, even though the country is still adhering to the revenue generated from oil exports. Further trade and investment liberalization is crucial for foreign direct investment. With the country's cheap and large labour force, there will be great potential to diversify the manufactured products.

Further research should be directed into two categories: 1) on the relationship of financial liberalization and economic growth (Fry, 1997; Tseng and Corker, 1991); 2) financing economic growth (Layman, 1998). This will provide a comprehensive coverage on the development of Indonesian economy.

References

Abuaf, Niso, and Philippe Jorion, (1990), "Purchasing Power Parity in the Long Run," *The Journal of Finance*, Vol.45, No.1, March, p.157-174.

ADB (Asian Development Bank), (1994), *Key Indicators of Developing Member Countries*, Oxford University Press, Manila.

Agbeyegbe, Terence D., (1992), Common Stochastic Trends: Evidence from the London Metal Exchange," *Bulletin of Economic Research*, Vol.44, No.2, p.141-151.

Aghevli, Bijan B., and Mohsin S. Khan, (1977), "Inflationary Finance and the Dynamics of Inflation: Indonesia 1951-1972," *American Economic Review*, Vol.67, p.309-403.

Aizenman, Joshua, (1984), "Modeling Deviations from Purchasing Power Parity (PPP)," *International Economic Review*, Vol.25, February, p.175-191.

Akaike, Hirotugu, (1973), "Information Theory and the Extension for the Maximum Likelihood Principle," in Petrov, B.N. and F. Csáki (eds)., *2nd International Symposium on Information Theory*, Akadémiai Kiadó, Budapest.

Alam, Asad, and Rajapatirana, Sarath, (1993), "Trade Reform in Latin America and the Caribbean," *Finance and Development*, Vol.30, No.3, September, p.44-47.

Anwar, Moh. Arsjad, Iwan Jaya Azis, Mari Pangestu, and Hadi Soesastro, (1991), "The Indonesian Economy: Problems and Prospects," *Asian Economic Journal*, Vol.5, No.2, p.100-136.

Ardeni, Pier Giorgio, and Diego Lubian, (1991), "Is There Trend Reversion In Purchasing Power Parity?" *European Economic Review*, Vol.35, p.1035-1055.

Ariff, Mohamed, and Hal Hill, (1985), *Export-Oriented Industrialisation: The Asean Experience*, Allen and Unwin Australia Pty Ltd..

Arize, Augustine, C., (1995), 'The Effects of Exchange-Rate Volatility on U.S. Exports: An Empirical Investigation," *Southern Economic Journal*, Vol.62, Iss.1, July, p.34-43.

Arndt, Heinz Wolfgang, (1977), "Survey of Recent Development," *Bulletin of Indonesian Economic Studies*, Vol.13, No.3, p.1-33.

Arndt, Heinz Wolfgang, (1978a), "Survey of Recent Development," *Bulletin of Indonesian Economic Studies*, Vol.14, No.1, p.1-30.

Arndt, Heinz Wolfgang, (1978b), "Survey of Recent Development," *Bulletin of Indonesian Economic Studies*, Vol.14, No.3, p.1-23.
Arndt, Heinz Wolfgang, and Hal Hill, (1999), *Southeast Asia's Economic Crisis: Origins, Lessons, and the Way Forward*, Institute of Southeast Asian Studies, Singapore.

Arshanapalli, Bala, and John Doukas, (1994), "Common Stochastic Trends in a System of Eurocurrency Rates," *Journal of Banking and Finance*, Vol.18, p.1047-1061.

Asseery, A., and David A. Peel, (1991), "The Effects of Exchange Rate Volatility on Exports: Some New Estimates," *Economics Letters*, Vol.37, p.173-177.

Atesoglu, H. Sonmez, (1997), "Balance-of-Payments-ConstrainedGrowth Model and its Implications for the United States," *Journal of Post Keynesian Economics*, Vol.19, Spring, No.3, p.327-335.

Bahmani-Oskooee, Mohsen, (1986), "Determinants of International Trade Flows: The Case of Developing Countries," *Journal of Developing Economics*, Vol.20, p.107-123.

Bahmani-Oskooee, Mohsen, (1993a), "Purchasing Power Parity Based on Effective Exchange Rate and Cointegration: 25 LDC's Experience with its Absolute Formulation," *World Development*, Vol.21, No.6, p.1023-1031.

Bahmani-Oskooee, Mohsen, (1993b), "Black market Exchange Rates Versus Official Exchange Rates in Testing Purchasing Power Parity: An Examination of the Iranian Rial," *Applied Economics*, Vol.25, p.465-472.

Bahmani-Oskooee, Mohsen, and Janardhanan Alse, (1993), "Export Growth and Economic Growth: An Application of Cointegration and Error-Correction Modelling," *The Journal of Developing Areas*, Vol.27, July, p.535-542.

Bahmani-Oskooee, Mohsen, Hamid Mohtadi, and Ghiath Shabsigh, (1991), "Exports, Growth and Causality in LDCs: A Re-examination," *Journal of Development Economics*, Vol.36, p.405-415.

Baillie, Richard T., and Tim Bollerslev, (1989a), "The Message in Daily Exchange Rates: A Conditional Variance Tale," *Journal of Business and Economic Statistics*, Vol.7, July, p.297-305.

Baillie, Richard T., and Tim Bollerslev, (1989b), "Common Stochastic Trends in a System of Exchange Rates," *The Journal of Finance*, Vol.44, No.1, March, p.167-181.

Baillie, Richard T., and Patrick McMahon, (1989), *The Foreign Exchange Market: Theory and Econometric Evidence*, Cambridge.

Bairam, Erkin, (1990), "The Harrod Foreign Trade Multiplier Revisited," *Applied Economics*, Vol.22, p.711-718.

Bairam, Erkin, and Georgina J. Dempster, (1991), "The Harrod Foreign Trade Multiplier and Economic Growth in Asian Countries," *Applied Economics*, Vol.23, p.1719-1724.

Balassa, Bela, (1964), "The Purchasing Power Parity Doctrine: A Reappraisal," *Journal of Political Economy*, Vol.72, p.584-596.

Balassa, Bela, (1978), "Exports and Economic Growth: Further Evidence", *Journal of Development Economics*, Vol.5, No.2, p.181-189.

Balassa, Bela, (1982), *Development Strategies in Semi Industrialised Countries*, The World Bank, Washington D.C..

Balassa, Bela, (1984), "Adjustment to External Shocks in Developing Economies," *World Bank Staff Working Paper*, p.472.

Balassa, Bela and Associates, (1971), *The Structure of Protection in Developing Countries*, John Hopkins University Press, Baltimore.

Balassa, Bela, and Marcus Noland, (1994), "Prospects of Trade and Regional Cooperation of the Industrializing Economies of East Asia," in Yang, Shu-Chin (ed.), *Manufactured Exports of East Asian Industrializing Economies: Possible Regional Cooperation,* M.E. Sharpe, Inc., Ch.13, p.237-260.

Banerjee, Anindya, Juan Dolado, John W. Galbraith, and David F. Hendry, (1993), *Co-Integration, Error-Correction, and the Econometric Analysis of Non-Stationary Data,* Oxford University Press.

Banerjee, Anindya, Robin L. Lumsdaine, and James H. Stock, (1992), "Recursive and Sequential Tests of the Unit-Root and Trend-Break Hypotheses: Theory and International Evidence," *Journal of Business & Economic Statistics,* Vol.10, July, No.3, p.271-287.

Bank Indonesia, (2000), *Policy Implementation in 1999 and Policy Directions for 2000.*

Barro, Robert, and Xavier, Sala-i-Martin, (1995), *Economic Growth,* McGraw-Hill.

Bayoumi, Tamim, and Ronald MacDonald, (1999), "Deviations of Exchange Rates from Purchasing Power Parity: A Story Featuring Two Monetary Unions," *IMF Staff Papers,* Vol.46, No.1, March, p.89-102.

Beveridge, Stephen, and Charles R. Nelson, (1981), "A New Approach to decomposition of Economic Time Series into Permanent and Transitory Components with Particular Attention to Measurement of the 'Business Cycle'," *Journal of Monetary Economics,* Vol.7, p.151-174.

Bhagwati, Jagdish N., (1978), *Foreign Trade Regimes and Economic Development: Anatomy and Consequences of Exchange Control Regimes,* Ballinger, Mass., Cambridge.

Bhagwati, Jagdish N., (1986), "Rethinking Trade Strategy," in John P. Lewis and Valeriana Kallab, (eds.), *Development Strategies Reconsidered,* Overseas Development Council, Washington, D.C..

Bhagwati, Jagdish N., (1990), "Export-Promoting Trade Strategy: Issues and Evidence," in Miller, Chris, (ed.), *Export Promotion Strategies: Theory and Evidence from Developing Countries,* New York University Press.

Binhadi, (1994), "Financial Deregulation and Bank Supervision: The Case of Indonesia," (ed.), in Faruqi, Shakil, *Financial Sector Reforms, Economic Growth, and Stability: Experiences in Selected Asian and Latin American Countries,* The World Bank, Washington, D.C., Ch.4, p.81-101.

Black, S.W., (1976), "Exchange Policies for Less Developed Countries in a World of Floating," (ed.), in Leipziger, Danny, *International Monetary System and the Developing Nations,* Washingston, D.C..

Blanchard, Olivier, J., and Mark W. Watson, (1986), "Are Business Cycles All Alike?" in Gordon, Robert J., (ed.), *Amercian Business Cycle,* Cambridge, Mass.: NBER.

Booth, Anne, (1988), "Survey of Recent Developments," *Bulletin of Indonesian Economic Studies,* Vol.24, No.1, April, p.3-35.

Booth, Anne, (1999), "Survey of Recent Developments," *Bulletin of Indonesian Economic Studies,* Vol.35, No.3, December, p.3-38.

Booth, Anne, and Peter McCawley, (1981), "The Indonesian Economy Since the Mid-Sixties," in Booth, Anne and Peter McCawley (eds.), *The Indonesian Economy During the Soeharto Era,* Oxford University Press, Ch.1, p.1-22.

Branson, William H., and Louka T. Katseli, (1982), "Currency Baskets and Real Effective Exchange Rates," in Gersovitz, Mark, Carlos F. Diaz-Alejandro, Gustav Ranis and Mark R. Rosenzweig, (eds.), *The Theory and Experience of Economic Development: Essays in Honor of Sir W. Arthur Lewis*, George Allen & Unwin (Publishers) Ltd., Ch.12, p.194-214.

Campbell, John Y., and N. Gregory Mankiw, (1987), "Permanent and Transitory Components in Macroeconomic Fluctuations," *American Economic Review: Papers and Proceedings*, Vol.77, p.111-117.

Caporale, Guglielmo Maria, (1993), "Is Europe an Optimal Currency Area? Symmetric Versus Asymmetric Shocks in the EC," *National Institute Economic Review*, Vol.144, May, p.95-103.

Cassel, Gustav, (1919), "The Depreciation of the German Mark," *Economic Journal*, Vol.29, p.496-506.

Cassel, Gustav, (1922), *Money and Foreign Exchange After 1914*, London: Constable and Co..

Chambers, Valerie, (1993), "ASEAN-EC Relations: The Intersection of Two Regional Groupings or the Rise of Economic Rivals?" *Journal of Asian Business*, Vol.9, No.2, Spring, p.55-76.

Charemza, Wojciech W., and Derek F. Deadman, (1992), *New Directions in Econometric Practice*, Edward Elgar.

Chishti, , Salim U., M. Aynul Hasan and Syed F. Mahmud, (1992), "Macroeconomic Modelling and Pakistan's Economy," *Journal of Development Economics*, Vol.38, p.353-370.

Cheung, Yin-Wong, and Kon S. Lai, (1995), "Lag Order and Critical Values of the Augmented Dickey-Fuller Test," *Journal of Business and Economic Statistics*, Vol.13, Iss.3; July, p.277-280.

Cheung, Yin-Wong, and Kon S. Lai, (1993a), "Long-Run Purchasing Power Parity During the Recent Float," *Journal of International Economics*, Vol.34, p.181-192.

Cheung, Yin-Wong, and Kon S. Lai, (1993b), Finite-Sample Sizes of Johansen's Likelihood Ratio Tests for Cointegration," *Oxford Bulletin of Economics and Statistics*, Vol.55, No.3, p.313-328.

Chow, Peter C. Y., (1987), "Causality Between Export Growth and Industrial Development: Empirical Evidence from the NICs," *Journal of Development Economics*, Vol.26, Iss.1, June, p.55-63.

Chowdhury, Abdur R., (1993), "Does Exchange Rate Volatility Depress Trade Flows? Evidence from Error-Correction Models," *The Review of Economics and Statistics*, Vol.75, Iss.4, November, p.700-706.

Chowdhury, Abdur R., and Fabio Sdogati, (1993), "Purchasing Power Parity in the Major EMS Countries: The Role of Price and Exchange Rate Adjustment," *Journal of Macroeconomics*, Vol.15, No.1, Winter, p.25-45.

Chung, Pin J., and Donald J. Liu, (1994), "Common Stochastic Trends in Pacific Rim Stock Markets," *The Quarterly Review of Economics and Finance*, Vol.34, No.3, Fall, p.241-259.

Cochrane, John H., (1988), "How Big is the Random Walk in GNP?" *Journal of Political Economy*, Vol. 96, No.5, p.893-920.

Cole, David C., and Betty F. Slade, (1991), "Reform of Financial Systems," in Dwight H. Perkins and Michael Roemer, (eds.), *Reforming Economic Systems in Developing Countries*, Harvard Institute for International Development, Harvard University Press, Ch.12, p.313-340.

Conejo, Carlos, and Michael P. Shields, (1993), "Relative PPP and the Long-Run Terms of Trade for Five Latin American Countries: A Cointegration Approach," *Applied Economics*, Vol.25, p.1511-1515.

Corden, Warner Max, (1974), *Trade Policy and Economic Welfare*, Clarendon Press, Oxford.

Corden, Warner Max, (1984a), "The Normative Theory of International Trade," in Jones, Ronald W. and Peter B. Kenen, (eds.), *Handbook of International Economics*, Vol.I, North-Holland, Amsterdam.

Corden, Warner Max, (1984b), "Booming Sector and Dutch Disease Economics: Survey and Consolidation", *Oxford Economic Papers*, Vol.36, p.359-380.

Corden, Warner Max, and J. Peter Neary, (1982), "Booming Sector and De-Industrialization in a Small Open Economy," *Economic Journal*, Vol.92, December, p.825-848.

Corsetti, Giancarlo, Paolo Pesenti, and Nouriel Roubini, (1998a), "What Caused the Asian Currency and Financial Crisis? Part I: A Macroeconomic Overview," *Working Paper Series*, 6833, December, National Bureau of Economic Research.

Corsetti, Giancarlo, Paolo Pesenti, and Nouriel Roubini, (1998a), "What Caused the Asian Currency and Financial Crisis? Part II: The Policy Debate," *Working Paper Series*, 6834, December, National Bureau of Economic Research.

Crockett, Andrew D., and Saleh M. Nsouli, (1977), "Exchange Rate Policies for Developing Countries," *Journal of Developing Studies*, Vol.13, April-July, p.125-143.

Cronbach, Lee J., (1951), "Coefficient Alpha and the Internal Structure of Tests," *Psychometrika*, Vol.16, No.3, September, p.297-334.

Crowder, William, (1994), "Foreign Exchange Market Efficiency and Common Stochastic Trends," *Journal of International Money and Finance*, Vol.13, No.5, p.551-564.

Darrat, Ali F., (1987), "Are Exports an Engine of Growth? Another Look at the Evidence," *Applied Economics*, Vol.19, p.277-283.

Das, Dilip K., (1993), "From Economic Integration to Economic Cooperation: Institutional Initiatives," *Journal of Asian Business*, Vol.9, No.3, Summer, p.47-69.

Davidson, Russell, and James G. MacKinnon, (1993), *Estimation and Inference in Econometrics*, Oxford University Press, New York, Ch.20.

Davutyan, Nurthan, and John Pippenger, (1990), "Testing Purchasing Power Parity: Some Evidence of the Effects of Transaction Costs," *Econometric Review*, Vol.9, No.2, p.211-240.

DeRosa, Dean A., (1986), "Trade and Protection in the Asian Developing Region," *Asian Development Review*, Vol.4, No.1, p.27-62.

Deyak, Timothy A., W. Charles Sawyer and Richard L. Sprinkle, (1993), "A Comparison of the Demand for Imports and Exports in Japan and the United States," *Journal of World Trade*, Vol.27, Iss.5, Oct. p.63-74.

Dick, Howard, (1979), "Survey of Recent Development," *Bulletin of Indonesian Economic Studies*, Vol.15, No.1, p.1-44.

Dickey, David A., and Wayne A. Fuller, (1979), "Distribution of the Estimators of the Autoregressive Time Series with a Unit Root," *Journal of the American Statistical Association*, Vol.74, p.427-431.

Dickey, David A., and Wayne A. Fuller, (1981), "Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root," *Econometrica*, Vol.49, p.1057-1072.

Djiwandono, J. Soedradjad, (2000), "Bank Indonesia and the Recent Crisis," *Bulletin of Indoneisan Economic Studies*, Vol.36, No.1, p.47-73.

Doan, Thomas A., (1992), *RATS User's Manual, Version 4*, Estima, Evanston, IL, US.

Dornbusch, Rudiger, (1976a), "Expectations and Exchange Rate Dynamics," *Journal of Political Economy*, Vol.84, December, p.1161-1176.

Dornbusch, Rudiger, (1976b), "Exchange Rate Expectations and Monetary Policy," *Journal of International Economics*, Vol.6, p.231-244.

Dornbusch, Rudiger, and Stanley Fischer, (1993), "Moderate Inflation," *The World Bank Economic Review*, Vol.7, No.1, p.1-44.

Dornbusch, Rudiger, and Alejandro Reynoso, (1989), "Financial Factors in Economic Development," *American Economic Review*, Vol.79, No.2, p.204-209.

Drake, Christine, (1989), "The Economic Dimension," in Drake, Christine, (ed.), *National Integration in Indonesia: Patterns and Policies*, University of Hawaii Press, Honolulu, Ch.5, p.145-184.

Duck, N.W., (1992), "UK Evidence on Breaking Trend Functions," *Oxford Economic Papers*, Vol.44, p.426-439.

Dutta, M., (1994), "Economic Regionalism in the Asia-Pacific: Macroeconomic Core and Microeconomic Optimization," *Journal of Asian Economics*, Vol.5, No.1, p.15-42.

Edison, Hali J., and Jan Tore Klovland, (1987), "A Quantitative Reassessment of the Purchasing Power Parity hypothesis: Evidence from Norway and the United Kingdom," *Journal of Applied Econometrics*, Vol.2, p.309-333.

Edwards, Sebastian, (1993), "Openness, Trade Liberalization, and Growth in Developing Countries," *Journal of Economic Literature*, Vol.XXXI, September, p.1358-1393.

Eklöf, Stefan, (1999), *Indonesian Politics in Crisis, The Long Fall of Suharto 1996-98*, Nordic Institute of Asian Studies, Great Britain.

Emery, Robert, (1967), "The Relation of Exports and Economic Growth", *Kyklos*, Vol.20, No.2, p.470-786.

Enders, Walter, (1989), "Unit Roots and the Real Exchange Rate Before World War I: the Case of Britain and the USA," *Journal of International Money and Finance*, Vol.8, p.59-73.

Enders, Walter, (1995), *Applied Econometric Time Series*, John Wiley & Sons, Inc., Canada.

Enders, Walter, and Stan Hurn, (1994), "Theory and Tests of Generalized Purchasing-Power Parity: Common Trends and Real Exchange Rates in the Pacific Rim," *Review of International Economics*, Vol.2, No.2, p.179-190.

Engle, Charles, (1992), "Real Exchange Rates and Relative Prices: An Empirical Investigation," NBER Working Paper, No.4231, December.

Engle, Charles, and C.S. Hakkio, (1993), "Exchange Rate Regimes and Volatility," Federal Reserve Bank of Kansas City *Economic Review*, Third Quarter, p.43-58.
Engle, Robert, F., (1983), "Estimates of the Variance of US Inflation Based Upon the ARCH Model," *Journal of Money, Credit, and Banking*, August, p.286-301.

Engle, Robert F., and Clive W.J. Granger, (1987), "Cointegration and Error-Correction: Representation, Estimation and Testing," *Econometrica*, Vol.55, p.251-276.

Engle, Robert F., and Clive W.J. Granger, (1991), (eds.), *Long-Run Economic Relationships*, Oxford University Press.

Evans, H. David, (1990), "Outward Orientation: An Assessment", in Miller, Chris, (ed.), *Export Promotion Strategies: Theory and Evidence from Developing Countries*, New York University Press, Ch.3, p.40-58.

Evans, Kevin, (1998), "Economic Update", in Geoff Forrester, (ed.), *Post-Soeharto Indonesia: Renewal or Chaos?* Institute of Southeast Asian Studies, Singapore, Ch.6, p.105-127.

Fajana, Olufemi, (1979), "Trade and Growth: The Nigerian Experience," *World Development*, Vol.7, No.1, p.73-78.

Fama, Eugene F., (1965), "The behaviour of Stock Market Prices," *Journal of Business*, Vol.38, p.34-105.

Fama, Eugene F., (1970), "Efficient Capital Markets: A Review of Theory and Empirical Work," *Journal of Finance*, Vol.25, p.383-417.

Feder, Gershon, (1983), "On Exports and Economic Growth", *Journal of Development Economics*, Vol.12, Nos.1-2, p.59-73.

Fields, Gary S., (1984), "Employment, Income Distribution and Economic Growth in Seven Small Open Economies", *Economic Journal*, Vol.94, p.74-83.

Fischer, Stanley, (1989), "Devaluation and Inflation," in Dornbusch, Rudiger and F.L.C.H. Helmers, (eds.), *The Open Economy: Tools for Policymakers in Developing Countries*, Oxford University Press, Ch.6, p.108-127.

Forrester, Geoff, (1999), (ed.), *Post-Soeharto Indonesia: Renewal or Chaos?* Institute of Southeast Asian Studies, Singapore.

Flynn, N. Alston, and Janice L. Boucher, (1993), "Tests of Long-Run Purchasing Power parity Using Alternative Methodologies," *Journal of Macroeconomics*, Vol.15, No.1, Winter, p.109-122.

Frankel, Jeffrey, A., (1992), "Is Japan Creating a Yen Bloc in East Asia and the Pacific?" *Working Paper 92-09*, Center for Pacific Basin Monetary and Economic Studies, Economic Research Department, Federal Reserve Bank of San Francisco, April.

Frankel, Jeffrey, A., David Romer, and Teresa Cyrus, (1996), "Trade and Growth in East Asian Countries: Causes and Effect?" *NBER Working Paper*, No.5732, August.

Frankel, Jeffrey, A., and Shang-Jin Wei, (1992), "Yen Bloc or Dollar Bloc: Exchange Rate Policies of the East Asian Economies," *Working Paper 93-01*, Center for Pacific Basin Monetary and Economic Studies, Economic Research Department, Federal Reserve Bank of San Francisco, December.

Frankel, Jeffrey, A., and Shang-Jin Wei, (1994), "Yen Bloc or Dollar Bloc? Exchange Rate Policies of the East Asian Economies," in Ito, Takatoshi and Anne O. Krueger, (eds.), *Macroeconomic Linkage: Savings, Exchange Rates, and Capital Flows*, National Bureau of Economic Research, Ch.12, p.295-329.

Fraser, Patricia, Mark P. Taylor and Alan Webster, (1991), "An Empirical Examination of Long-Run Purchasing Power Parity as Theory of International Commodity Arbitrage," *Applied Economics*, Vol.23, p.1749-1759.

Frenkel, Jocab, (1981), "Collapse of Purchasing Power Parity During the 1970s," *European Economic Review*, Vol.16, p.145-165.

Frennberg, Per and Bjorn Hansson, (1993), "Testing the Random Walk Hypothesis on Swedish Stock Prices: 1919-1990," *Journal of Banking and Finance*, Vol.17, p.175-191.

Freris, Andrew, (1990), "Indonesia: Deregulation and Growth," *Asian Monetary Monitor*, September-October, p.11-33.

Fry, Maxwell J., (1997), "In Favour of Financial Liberalisation," *The Economic Journal*, May, Vol.107, p.754-770.

Fujita, Natsuki and William E. James, (1997), "Employment Creation and Manufactured Exports in Indonesia, 1980-90," *Bulletin of Indonesian Economic Studies*, Vol.33, No.1, April, p.103-115.

Fuller, Wayne A., (1976), *Introduction to Statistical Time Series*, John Wiley, New York.

Fung, Hung-Gay, and Wai-Chung Lo, (1992), "Deviations from Purchasing Power Parity," *The Financial Review*, Vol.27, No.4, November, p.553-570.

Fung, Hung-Gay, and Wai-Chung Lo, and John E. Peterson, (1994), "Examining the Dependency in Intra-Day Stock Index Futures," *The Journal of Futures Markets*, Vol.14, No.4, 405-419.

Gelb, Alan, H., and Bruce Glassburner, (1988), "Indonesia: Windfalls in a Poor Rural Economy," in Alan, H. Gelb and associates (eds.), *Oil Windfalls: Blessing or Curse?*, New York, Oxford University Press, Ch.12, p.197-226.

Gemmell, Norman, (1998), "Reviewing the New Growth Literature," *New Political Economy*, Vol.3, Issue 1, p.129-134.

Georgellis, Yannis, (1994), "The Oil Price Shocks and the Unit Root Hypothesis: The UK Experience," *Applied Economics*, Vol.26, p.827-830.

Geweke, John, Richard Meese, and Warren Dent, (1983), "Comparing Alternative Tests of Causality in Temporal Systems: Analytic Results and Experimental Evidence," *Journal of Econometrics*, Vol.21, p.161-194.

Ghartey, Edward E. (1993), "Causal Relationship between Exports and Economic Growth: Some Empirical Evidence in Taiwan, Japan and the US," *Applied Economics*, Vol.25, p.1145-1152.

Gibbons, Jean Dickinson, (1985), *Nonparametric Statistical Inference*, Marcel Dekker, Inc.

Gillis, Malcolm, (1984), "Episodes in Indonesian Economic Growth," in Harberger, Arnold C., (ed.), *World Economic Growth*, Institute for Contemporary Studies Press, Ch.9, p.231-264.

Giovannetti, Giorgia, (1992), "A Survey of Recent Empirical Tests of the Purchasing Power Parity Hypothesis," Banco Nazionale Del Lavoro *Quarterly Review*, No.180, March, p.81-101.

Glen, Jack D., (1992), "Real Exchange Rates in the Short, Medium, and Long Run," *Journal of International Economics*, Vol.33, p.147-166.

Goldstein, Morris, and Mohsin S. Khan, (1976), "Large vs. Small Price Changes in the Demand for Imports," *Staff Papers*, Vol.23, March, p.200-225.

Gonçalves, Reinaldo, and Jürgen Richtering, (1987), "Intercountry Comparison of Export Performance and Output Growth," *The Developing Economies*, Vol.25, No.1, Mar., p.3-18.

Gonzaga, Gustavo M., and Maria Cristina T. Terra, (1997), "Equilibrium Real Exchange Rate, Volatility, and Stabilization," *Journal of Development Economics*, Vol.54, p.77-100.

Goto, Junichi, and Koichi Hamada, (1994), "Economic Preconditions for Asian Regional Integration," in Ito, Takatoshi and Anne O. Krueger, (eds.), *Macroeconomic Linkage: Savings, Exchange Rates, and Capital Flows*, National Bureau of Economic Research, Ch.14, p.359-387.

Granger, Clive W. J., (1980), "Testing for Causality: A Personal Viewpoint," *Journal of Economic Dynamics and Control*, Vol.2, 303-328.

Granger, Clive W. J., (1983), "Cointegrated Variables and Error-Correction Models," Discussion Paper, University of California, San Diego.

Granger, Clive W.J., (1986), "Developments in the Study of Cointegrated Economic Variables," *Oxford Bulletin of Economics and Statistics*, Vol.48, p.213-228.

Granger, Clive W.J., (1988), "Some Recent Developments in a Concept of Causality," *Journal of Econometrics*, Vol.39, p.199-211.

Granger, Clive W.J., (1991), (ed.), *Modelling Economic Series: Readings in Econometric Methodology*, Oxford University Press.

Granger, Clive W.J. and Paul Newbold, (1974), "Spurious Regressions in Econometrics," *Journal of Econometrics*, Vol.2, p.111-120.

Green, David Jay, (1994), "Convergence and Cohesion within the ASEAN-4," *Journal of Asian Economics*, Vol.5, No.1, p.119-144.

Greenaway, David, (1986), "Characteristics of Industrialization and Economic Performance Under Alternative Development Strategies," Background Paper for *World Development Report 1987*, The World Bank, Washington, D.C, Ch.5.

Greenaway, David, and Chong Hyun Nam, (1988), "Industrialization and Macroeconomic Performance in Developing Countries Under Alternative Trade Strategies", *Kyklos*, Vol.41, No.3, p.419-435.

Greenaway, David, and Chris R. Milner, (1986), *The Economics of Intra Industry Trade*, Basil Blackwell, Oxford.

Greenaway, David, and Chris R. Milner, (1987), "Trade Theory and the Less Developed Countries," in Norman Gemmell,(ed.), *Surveys in Development Economics*, Basil Blackwell Ltd..

Greenaway, David, and Geoffrey Reed, (1990), "Empirical Evidence on Trade Orientation and Economic Performance in Developing Countries," in Miller, Chris, (ed.), *Export Promotion Strategies: Theory and Evidence from Developing Countries*, New York University Press, Ch.4, p.59-77.

Grobar, Lisa Morris, (1993), "The Effect of Real Exchange Rate Uncertainty on LDC Manufactured Exports," *Journal of Development Economics*, Vol.41, p.367-376.

Grossman, Sanford J., and Joseph E. Stiglitz, (1980), "On the Impossibility of Informationally Efficient Markets," *American Economic Review*, Vol.66, p.246-253.

Guisinger, Stephen E., (1980), "Direct Controls in the Private Sector", in John, Cody, Helen Hughes and David Wall, (eds), *Policies for Industrial Progress in Developing Countries*, Oxford University Press, Oxford, for the World Bank, p.189-209.

Hafer, R.W., and Ali M. Kutan, (1994), "A Long-Run View of German Dominance and the Degree of Policy Convergence in the EMS," *Economic Inquiry*, Vol.32, October, p.684-695.

Hakkio, Craig S., (1986), "Does the Exchange Rate Follow a Random Walk? A Monte Carlo Study of Four Tests for a Random Walk?" *Journal of International Money and Finance*, Vol.5, p.221-229.

Hall, Bronwyn H., (1995), *TSP Reference Manual, Version 4.3*, TSP International, US.

Hieke, Hubert, (1997), "Balance-of-Payments-Constrained Growth: A Reconsideration of the evidence for the U.S. Economy," *Journal of Post Keynesian Economics*, Vol.19, Spring, No.3, p.313-325.

Hill, Hal, (1988), *Foreign Investment and Industrialization in Indonesia*, Oxford University Press.

Hill, Hal, (1990a), "Indonesia's Industrial Transformation: Part I," *Bulletin of Indonesian Economic Studies*, Vol.26, No.2, August, p.79-120.

Hill, Hal, (1990b), "Indonesia's Industrial Transformation: Part II," *Bulletin of Indonesian Economic Studies*, Vol.26, No.3, December, p.75-109.

Hill, Hal, (1990c), "Indonesia: Export Promotion After the Oil Boom," in Chris Milner, (ed.), *Export Promotion Strategies: Theory and Evidence from Developing Countries*, New York University Press, Ch.10, p.185-212.

Hill, Hal, (1992), "Manufacturing Industry," in Booth, Anne, (ed.), *The Oil Boom and After: Indonesian Economic Policy and Performance in the Soeharto Era*, Oxford University Press, Ch.7, p.204-257.

Hill, Hal, (1996), *The Indonesian Economy Since 1966: Southeast Asia's Emerging Giant*, Cambridge University Press.

Hill, Hal, (1997), *Indonesia's Industrial Transformation*, Institute of Southeast Asian Studies (ISEAS), Singapore.

Hirschman, Albert O., (1968), "The Political Economy of Import-Substituting Industrialization in Latin America," *Quarterly Journal of Economics*, Vol.82, p.1-12.

Hobohm, Sarwar, (1987), "Indonesia to 1991: Can Momentum be regained?", The Economic Intelligence Unit, Special Report No.1077, The Economist Publications Limited, U.K..

Hughes, Helen, (1995), "Why Have East Asian Countries Led Economic Development?" *The Economic Record*, Vol.71, No.212, March, p.88-104.

Huizinga, John, (1987), "An Empirical Investigation of the Long-Run Behaviour of Real Exchange Rates," *Carnegie-Rochester Conference Series on Public Policy*, Vol.27, p.149-214.

Hunt, Diana, (1989), *Economic Theories of Development: an analysis of competing paradigms*, Harvester Wheatsheaf.

IMF Staff, (1998), "The Asian Crisis: Causes and Cures," *Finance and Development*, Vol.35, No.2, p.18-21.

Isard, Peter, (1977), "How Far Can We Push the Law of One Price?" *American Economic Review*, Vol.67, p.942-948.

Jeon, Bang Nam, and Thomas C. Chiang, (1991), "A System of Stock Prices in World Stock Exchanges: Common Stochastic Trends for 1975-1990?" *Journal of Economics and Business*, Vol.43, p.329-338.

Johansen, Søren, (1988), "Statistical Analysis of Cointegrated Factors," *Journal of Economic Dynamics and Control*, Vol.12, June/September, p.231-254.

Johansen, Søren, (1989), "Likelihood Based Inference on Cointegration: Theory and Applications," Mimeo, Institute of Mathematical Statistics, University of Copenhagen.

Johansen, Søren, (1991), "The Power Function for the Likelihood Estimation and Inference for Cointegration," in Gruber, J., (ed.), *Econometric Decision Models: New Methods of Modelling and Applications*, Springer Verlag, New York, N.Y., p.323-335.

Johansen, Søren, (1992), "Determination of Cointegration Rank in the Presence of a Linear Trend," *Oxford Bulletin of Economics and Statistics*, Vol.54, No.3, p.383-397.

Johansen, Søren, (1995), "Likelihood-Based Inference in Cointegrated Vector Autoregressive Models," in Granger, C. W. J. and G. E. Mizon, (ed.), *Advanced Texts in Econometrics*, Oxford University Press, UK.

Johansen, Søren, and Katarina Juselius, (1990), "Maximum Likelihood Estimation and Inference on Cointegration: with Applications to the Demand for Money," *Oxford Bulletin of Economics and Statistics*, Vol.52, p.169-210.

Johansen, Søren, and Katarina Juselius, (1992), "Testing Structural Hypothesis in a Multivariate Cointegration analysis of the PPP and UIP for UK," *Journal of Econometrics*, Vol.53, p.211-244.

Johnson, C., (1998), "Survey of Recent Development," *Bulletin of Indonesian Economic Studies*, Vol.34, No.2, p.3-60.

Johnson, Paul A., (1991), "Aggregate Price Indexes, Cointegration, and Tests of the Purchasing Power Parity Hypothesis," *Economic Letters*, Vol.36, p.305-309.

Jomo, K.S., (1998), (ed.), *Tigers in Trouble: Financial Governance, Liberalisation and Crisis in East Asia*, Hong Kong University Press, Hong Kong.

Joyosumaro, Subarjo, (2000), *Bank Restructuring, Indonesia's Approach*, Bank Indonesia.

Jung, Woo S, and Peyton J. Marshall, (1985), "Exports, Growth and Causality in Developing Countries," *Journal of Development Economics*, Vol.18, p.1-12.

Junge, Georg, (1984), *Purchasing Power Parity and the International Transmission of Price Disturbances Under Alternative Exchange Rate Regimes*, The HWWA-Institut für Wirtschaftsforschung-Hamburg.

Kasa, Kenneth, (1992), "Common Stochastic Trends in International Stock Markets," *Journal of Monetary Economics*, Vol.29, p.95-124.

Kavoussi, Rostam M., (1984), "Export Expansion and Economic Growth," *Journal of Development Economics*, Vol.14, p.241-250.

Keating, John W., (1990), "Identifying VAR Models Under Rational Expectations," *Journal of Monetary Economics*, Vol.25, No3, June, p.453-476.

Keesing, Donald B. and Sanjaya Lall, (1992), "Marketing Manufactured Exports from Developing Countries: Learning Sequences and Public Support," in Helleiner, Gerald K., (ed.), *Trade Policy, Industrialization, and Development: New Perspectives*, Clarendon Press, Oxford.

Kenen, Peter B., (1987), "Global Policy Optimization and the Exchange-Rate Regime," *Journal of Policy Modeling*, Vol.9, Iss. 1, Spring, p.19-63.

Kenen, Peter B., and Dani Rodrik, (1986), "Measuring and Analyzing the Effects of Short-term Volatility in Real Exchange Rates," *The Review of Economics and Statistics*, Vol.68, p.311-315.

Kim, Duk-Choong, (1992), "Open Regionalism in the Pacific: A World of Trading Blocs?" *American Economic Review*, Vol.82, No.2, May, p.79-83.

Kim, Jin-Ock, and Walter Enders, (1991), "Real and Monetary Causes of Real Exchange Movements in the Pacific Rim," *Southern Economic Journal*, Vol.57, No.4, April, p.1061-1070.

Kirkpatrick, Colin, (1987), "Trade Policy and Industrialization in LDCs," in Norman Gemmell, (ed.), *Surveys in Development Economics*, Basil Blackwell Ltd.

Kirkpatrick, Colin, (1994), "Regionalisation, Regionalism and East Asian Economic Cooperation," *World Economy*, Vol.17, Iss.2, March, p.191-202.

Kirkpatrick, Colin, and Frederick I. Nixson, (1983), *The Industrialization of Less Developed Countries*, (eds.), Manchester University Press, Manchester.

Koop, G., M. Hashem Pesaran and S.M. Potter, (1996), "Impulse Response Analysis in Nonlinear Multivariate Models," *Journal of Econometrics*, Vol.74, p.119-147.

Koray, Faik, and William D. Lastrapes, (1989), "Real Exchange Rate Volatility and U.S. Bilateral Trade: A VAR Approach," *The Review of Economics and Statistics*, Vol.71, Iss.4, November, p.708-712.

Krishna, Kala, Ataman Ozyildirim and Norman R. Swanson, (1998), "Trade, Investment, and Growth: Nexus, Analysis and Prognosis," *NBER Working Paper Series*, No.6861, December.

Krueger, Anne O., (1978), *Foreign Trade Regimes and Economic Development: Liberalization Attempts and Consequences*, Ballinger for NBER, Cambridge, Mass..

Krueger, Anne O., (1984), "Trade Policies in Developing Countries," in Jones, Ronald W. and Peter B. Kenen, (eds.), *Handbook of International Economics*, Vol.I, North-Holland, Amsterdam.

Krueger, Anne O., (1990), "Import Substitution Versus Export Promotion," in King, Philip, (ed.), *International Economics and International Economic Policy: A Reader*, McGraw-Hill, Inc., Ch.10, p.155-165.

Krugman, Paul, (1978), "Purchasing Power Parity and Exchange Rates: Another Look at the Evidence," *Journal of International Economics*, Vol.3, 397-407.

Kugler, Peter, and Carlos Lenz, (1993), "Multivariate Cointegration Analysis and the Long-Run Validity of PPP," *The Review of Economics and Statistics*, Vol.75, February, p.180-184.

Kunst, Robert M. and Dalia Marin, (1989), "On Exports and Productivity: A Causal Analysis", *The Review of Economics and Statistics*, Vol.51, No.4, Nov., p.699-703.

Kwan, C. H., (1994), *Economic Interdependence in the Asia-Pacific Region: Towards a Yen Bloc*, London: Routledge.

Labson, B. Stephen, and Paul L. Crompton, (1993), "Common Trends in Economic Activity and Metals Demand: Cointegration and the Intensity of Use Debate," *Journal of Environmental Economics and Management*, Vol.25, p.147-161.

Lal, Deepak, (1983), *The Poverty of Development Economics*, Hobart Paperback, 16, Institute of Economic Affairs.

Langhammer, Rolf J., (1988), "Financing of Foreign Direct Investment and Trade Flows: THe Case of Indonesia," *Bulletin of Indonesian Economic Studies*, Vol.24, No.1, April, p.97-114.

Lastrapes, William D., and Faik Koray, (1990), "Exchange Rate Volatility and U.S. Multilateral Trade Flows," *Journal of Macroeconomics*, Vol.12, No.3, p.341-362.

Lawrence, Robert Z., (1994), "Regionalism: An Overview," *Journal of the Japanese and International Economies*, Vol.8, p.365-387.

Layman, Thomas A., (1988), "Financing Growth and Development," in Scalapino, Robert A. & *et. al.*, (ed.), *Pacific-Asian Economic Policies and Regional Interdependence*, Institute of East Asian Studies, University of California, Berkeley, Ch.12, p.273-307.

Layton, Allan P., and Jonathan P. Stark, (1990), "Co-integrationas an Empirical Test of Purchasing Power Parity," *Journal of Macroeconomics*, Vol.12, No.1, Winter, p.125-136.

Lim, G.C., (1992), "Testing for the Fundamental Determinants of the Long Run Real Exchange Rate," *Journal of Banking and Finance*, Vol.16, p.625-642.

Lippert, A.F., and J.B. Breuer, (1994), "Purchasing Power Parity and Real Factors," *Applied Economics*, Vol.26, p.1029-1036.

Lippi, Marco, and Lucrezia Reichlin, (1994), "Common and Uncommon Trends and Cycles," *European Economic Review*, Vol.38, p.624-635.

Litterman, Robert B., and Laurence Weiss, (1985), "Money, Real Interest Rates and Output: A Reinterpretationof Postwar U.S. Data," *Econometrica*, Vol.5, p.129-156.

Little, Ian, Tibor Scitovsky, and Maurice Scott, (1970), *Industry and Trade in Some Developing Countries*, Oxford University Press, London.

Liu, Christina Y., and Jia He, (1991a), "A Variance-Ratio Test of Random Walks in Foreign Exchange Rates," *Journal of Finance*, Vol.46, No.2, June, p.773-785.

Liu, Christina Y., and Jia He, (1991b), "Do Real Exchange Rates Follow Random Walks?: A Heteroscedasticity-Robust Autocorrelation Test," *International Economic Journal*, Vol.5, No.3, Autumn, p.39-49.

Liu, Peter C., and G.S. Maddala, (1992), "Rationality of Survey Data and Tests for Market Efficiency in the Foreign Exchange Markets," *Journal of International Money and Finance*, Vol.11, p.366-381.

Lo, Andrew W., and A. Craig MacKinlay, (1988), "Stock Market Prices Do Not Follow Random Walks: Evidence From a Simple Specification Test," *The Review of Financial Studies*, Vol.1, No.1, Spring, p.41-66.

Lo, Andrew W., and A. Craig MacKinlay, (1989), "The size and Power of the Variance Ratio Test in Finite Samples: A Monte Carlo Investigation," *Journal of Econometrics*, Vol.40, p.203-238.

Logue, D.E., and G.S. Oldfield, (1977), "Managing Foreign Assets When Foreign Exchange Markets Are Efficient," *Financial Management*, Summer, p.16-22.

Lütkepohl, Helmut, (1990), "Asymptotic Distributions of Impulse Response Functions and Forecast Error Variance Decompositions of Vector Autoregressive Models," *Review of Economics and Statistics*, Vol.72, Iss.1, February, p.116-125.

Lütkepohl, Helmut and Hans-Eggert Reimers, (1992), "Impulse Response Analysis of Cointegrated System," *Journal of Economic Dynamics and Control*, Vol.16, p.53-78.

MacDonald, Ronald, and David Power, (1992), "Persistence in UK Stock Market Returns: Some Evidence Using High-Frequency Data," *Journal of Business Finance & Accounting*, Vol.19, No.4, June, p.505-514.

MacIntyre, Andrew J., (1992), "Politics and the Reorientation of Economic Policy in Indonesia," in MacIntyre, Andrew J. and Kanishka Jayasuriya, (eds.), *The Dynamics of Economic Policy Reform in South-east Asia and the South-west Pacific*, Ch.9, p.138-157.

MacKinnon, James G., (1990), Critical Values for Cointegration Tests, *UC San Diego Discussion Paper*, 90-4.

MacKinnon, James G., (1994), "Approximate Asymptotic Distribution Functions for Unit Root and Cointegration Tests," *Journal of Business and Economic Statistics*, April, p.167-176.

Mahdavi, Saeid, and Su Zhou, (1994), "Purchasing Power Parity in High-Inflation Countries: Further Evidence," *Journal of Macroeconomics*, Vol.16, No.3, Summer, p.403-422.

Maizels, Alfred, (1968), *Exports and Economic Growth of Developing Countries*, Cambridge University Press, Cambridge.

Malliaris, A.G., and Jorge Urrutia, (1991), "Tests of Random Walk of Hedge Ratios and Measures of Hedging Effectiveness for Stock Indexes and Foreign Currencies," *The Journal of Futures Markets*, Vol.11, No.1, p.55-68.

Manzur, Meher, (1993), *Exchange Rates, Prices and World Trade: New Methods, Evidence and Implication*, Routledge, London.

Marin, Dalia, (1992), "Is the Export-led Growth hypothesis Valid for Industrialised Countries?", *The Review of Economics and Statistics*, Vol.74, No.4, Nov., p.678-688.

Martin, Will, Peter A. Petri, and Koji Yanagishima, (1994), "Charting the Pacific: An Empirical Assessment of Integration Initiatives," *The International Trade Journal*, Vol.8, No.4, Winter, p.447-482.

Masih, A.M.M., (1987), "An Econometric Analysis of the Structuralist-MonetaristExplanation of Inflation in Developing Asian Countries: A Comparative Study of Korea, Philippines, Indonesia, Malaysia and Thailand," *The Philippine Economic Journal*, Vol.26, No.3 & 4, p.213-239.

McCallum, Bennett T., (1993), "Unit Roots in Macroeconomic Time Series: Some Critical Issues," Federal Reserve Bank of Richmond *Economic Quarterly*, Vol.79, No.2, Spring, p.13-43.

McCombie, J.S.L. and A.P. Thirlwall, (1994), *Economic Growth and the Balance-of-Payments Constraint*, St. Martin's Press.

McGregor, Peter G. and J.K. Swales, (1985), "Professor Thirlwall and Balance of Payments Constrianed Growth," *Applied Economics*, Vol.17, p.17-32.

McGregor, Peter G. and J.K. Swales, (1991), "Thirlwall's Law and Balance of Payments Constrained Growth: Further Comment on the Debate," *Applied Economics*, Vol.23, p.9-20.

McKinnon, Ronald I., (1963), "Optimal Currency Areas," *American Economic Review*, Vol. 53, p.17-25.

McNown, Robert, and Myles S. Wallace, (1989), "National Price Levels, Purchasing Power Parity, and Cointegration: A Test of Four High Inflation Economies," *Journal of International Money and Finance*, Vol.8, p.533-545.

McNown, Robert, and Myles S. Wallace, (1990), "Cointegration Tests of PPP Among Four Industrial Countries: Results for Fixed and Flexible Rates," *Applied Economics*, Vol.22, p.1729-1737.

Mellander, E., A. Vredin and A. Warne, (1992), "Stochastic Trends and Economic Fluctuations in a Small Open Economy," *Journal of Applied Econometrics*, Vol.7, p.369-394.

Michaely, Michael, (1979), "Exports and Growth: A Reply," *Journal of Development Economics*, Vol.6, No.1, p.141-143.

Miller, Stephen M., (1991), "Monetary Dynamics: An Application of Cointegration and Error-Correction Modelling," *Journal of Money, Credit, and Banking*, Vol.23, No.2, May, p.139-154.

Miller, Stephen M., and Frank S. Russek, (1990), "Co-Integration and Error-Correction Models: The Temporal Causality Between Government Taxes and Spending," *Southern Economic Journal*, June, p.221-229.

Milone, Luciano Marcello, (1986), "Law of One Price: Further Empirical Evidence Concerning Italy and the UK," *Applied Economics*, Vol.18, p.645-661.

Moon, Choon-Geol, and Parul Jain, (1995), "Macroeconomic Aspects of Korea's Liberalization Policy: A Cointegrated VAR Study," *Journal of Asian Economics*, Vol.6, No.4, p.469-492.

Moore, Michael J., (1993), "Systems of Bilateral Real Exchange Rates," *Applied Economics*, Vol.25, p.1161-1166.

Moosa, Imad A., (1994), "Testing Proportionality,Symmetry and Exclusiveness in Long-run PPP," *Journal of Economic Studies*, Vol.21, No.3, p.3-21.

Montes, Manuel F., (1998), *The Currency Crisis in Southeast Asia: Updated*, Institute of Southeast Asian Studies, Singapore.

Moschos, Demetrios, (1989), "Export Expansion, Growth and the Level of Economic Development: An Empirical Analysis," *Journal of Development Economics*, Vol.30, Iss.1, January, p.93-102.

Mukerjee, Swati, (1992), "Modelling and Estimation of Export Equations within a Multisectoral Model: The Indian Case," *The Journal of Developing Areas*, Vol.26, July, p.507-520.

Mundell, Robert A., (1961), "The Theory of Optimum Currency Areas," *American Economic Review*, Vol.51, p.657-665.

Muscatelli, Vito Antonio, and Stan Hurn, (1992), "Cointegration an Dynamic Time Series Models," *Journal of Economic Surveys*, Vol.6, No.1, p.1-43.

Muscatelli, Vito Antonio, Andrew A. Stevenson, and Catia Montagna, (1994), "Intra-NIE Competition in Exports of Manufactures," *Journal of International Economics*, Vol.37, p.29-47.

Muscatelli, Vito Antonio, Andrew A. Stevenson, and Catia Montagna, (1995), "Modeling Aggregate Manufactured Exports for Some Asian Newly Industrialized Economies," *The Review of Economics and Statistics*, Vol.77, Iss.1, February, p.147-155.

Neary, J. Peter, (1985), "Real and Monetary Aspects of the Dutch Disease," in Jugenfelt, Kaul K. and Douglas C. Hague, (eds.), *Structural Adjustment in Developed Open Economies*, Macmillan Press, London, p.357-391.

Nelson, Charles R., and Charles I. Plosser, (1982), "Trends and Random Walks in Macroeconomic Time Series: Some Evidence and Implications," *Journal of Monetary Economics*, Vol.10, p.139-162.

Nasution, Anwar, (1991), "The Adjustment Program in the Indonesian Economy Since the 1980s," in Hill, Hal, (ed.), *Indonesia Assessment 1991*, Political and Social Change Monograph 13, Australian National University, Ch.2, p.14-37.

Nasution, Anwar, (1992), "The Years of Living Dangerously: The Impacts of Financial Sector Policy Reforms and Increasing Private Sector External Indebtedness in Indonesia, 1983-1992," *The Indonesian Quarterly*, Vol.20, No.4, p.405-437.

Officer, Lawrence H., (1978), "The Relationship Between Absolute and Relative Purchasing Power Parity," *Review of Economics and Statistics*, Vol.60, p.562-868.

Officer, Lawrence H., (1980), "Effective Exchange Rates and Price Ratios Over the Long Run: a Test of the Purchasing Power Parity Theory," *Canadian Journal of Economics*, Vol.13, p.206-230.

Osterwald-Lenum, Michael, (1990), Recalculated and Extended Tables of the Asymptotic Distribution of some Important Maximum Likelihood Cointegration Test Statistics, Unpublished Manuscript.

Oxley, Les, (1993), "Cointegration, Causality and Export-led Growth in Portugal, 1865-1985," *Economics Letters*, Vol.43, p.163-166.

Parker, Stephen, (1991), "Survey of Recent Developments," *Bulletin of Indonesian Economic Studies*, Vol.27, No.1, April, p.3-38.

Panagariya, Arvind, (1994a), "East Asia: A New Trading Bloc?" *Finance and Development*, March, p.16-19.

Panagariya, Arvind, (1994b), "East Asia and the New Regionalism in World Trade," *The World Economy*, Vol.17, No.6, November, p.817-839.

Pangestu, Mari, (1990), "Adjustment Problems of Small Oil-Exporting Country: Did Indonesia Suffer from the Dutch Disease?" in Naya, Seiji, and Akira Takayama, (eds.), *Economic Development in East and Southeast Asia: Essays in Honor of Professor Shinichi Ichimura*, Institute of Southeast Asian Studies, Ch.8, p.121-137.

Pangestu, Mari, (1994), "Indonesia: From Dutch Disease to Manufactured Exports," in Yang, Shu-Chin (ed), *Manufactured Exports of East Asian Industrializing Economies: Possible Regional Cooperation*, M.E. Sharpe, Inc., Ch.11, p.217-230.

Pantula, Sastry G., Graciela Gonzalez-Farias, and Wayne A. Fuller, (1994), "A Comparison of Unit Root Test Criteria," *Journal of Business and Economic Statistics*, October, p.449-459.

Patel, Jayendu, (1990), "Purchasing Power Parity as a Long-Run Relation," *Journal of Applied Econometrics*, Vol.5, p.567-379.

Perman, Roger, (1991), "Cointegration: An Introduction to the Literature," *Journal of Economic Issues*, Vol.18, No.3, p.3-30.

Perron, Pierre, (1988), "Trends and Random Walks in Macroeconomic Time Series," *Journal of Economic Dynamics and Control*, Vol.12, p.333-346.

Perron, Pierre, (1989), "The Great Crash, The Oil Price Shock, and the Unit Root Hypothesis," *Econometrica*, Vol.57, No.6, November, p.1361-1401.

Perron, Pierre, (1990), "Testing for a Unit Root in a Time Series With a Changing Mean," *Journal of Business & Economic Statistics*, Vol.8, No.2, April, p.153-162.

Perron, Pierre, and Timothy J. Vogelsang, (1992), "Nonstationarity and Level Shifts With an Application to Purchasing Power Parity," *Journal of Business & Economic Statistics*, Vol.10, No.3, July, p.301-320.

Pesaran, M. Hashem, and Bahram Pesaran, (1991), *Microfit 3.0: an Interactive Econometric Software Package User Manual*, Oxford University Press.

Pesaran, M. Hashem and Bahram Pesaran, (1997), *Working with Microfit 4.0: Interactive Econometric Analysis*, Oxford University Press.

Pesaran, M. Hashem and Y. Shin, (1997), "Generalized Impulse Response Analysis in Linear Multivariate Models," unpublished manuscript, Cambridge University.

Peterson, Richard L., Christopher K. Ma, and Robert J. Ritchey, (1992), "Dependence in Commodity," *The Journal of Futures Markets*, Vol.12, No.4, p.429-446.

Phillips, Peter C.B., (1987), "Time Series Regression with a Unit Root," *Econometrica*, Vol.55, p.277-301.

Phillips, Peter C.B., (1991), "Optimal Inference in Cointegrated Systems," *Econometrica*, Vol.59, p.283-306.

Phillips, Peter C.B., and Pierre Perron, (1988), "Testing for a Unit Root in Time Series Regression," *Biometrika*, Vol. 75, June, p.335-346.

Phylaktis, Kate, (1990), "Purchasing Power Parity and Cointegration in Three High Inflation Economies," Discussion Paper, City University Business School.

Phylaktis, Kate, (1992), "Purchasing Power Parity and Cointegration: the Greek Evidence from the 1920s," *Journal of International Money and Finance*, Vol.11, p.502-513.

Phylaktis, Kate, and Yiannis Kassimatis, (1993), "Long-Run Purchasing Power Parity: Evidence from Eight Pacific-Basin Countries," in Bos, Theodore, and Thomas A. Fetherston, (eds.), *Research in International Business and Finance - Rising Asian Capital Market: Empirical Studies*, JAI Press Inc., Vol.10, p.85-98.

Phylaktis, Kate, and Yiannis Kassimatis, (1994), "Does the Real Exchange Rate Follow a Random Walk? The Pacific Basin Perspective," *Journal of International Money and Finance*, Vol.13, p.476-495.

Pippenger, Michael K., (1993), "Cointegration Tests of Purchasing Power Parity: The Case of Swiss Exchange Rates," *Journal of International Money and Finance*, Vol.12, p.46-61.

Plummer, Michael G., and Pearl Imada Iboshi, (1994), "Economic Implications of NAFTA for ASEAN Members: A Disaggregated Approach," *ASEAN Economic Bulletin*, Vol.11, No.2, November, p.158-175.

Pozo, Susan, (1992), "Conditional Exchange-Rate Volatility and the Volume of International Trade: Evidence From the Early 1900s," *The Review of Economics and Statistics*, Vol.74, Iss.2, May, p.325-329.

Quandt, Richard E., (1958), "The Estimation of a Linear Regression System Obeying Two Separate Regimes," *Journal of the American Statistical Association*, Vol.53, p.873-880.

Ram, Rati, (1985), "Exports and Economic Growth: Some Additional Evidence," *Economic Development and Cultural Change*, Vol.33, p.415-425.

Ram, Rati, (1987), "Exports and Economic Growth in Developing Countries: Evidence from Time-Series and Cross-Section Data," *Economic Development and Cultural Change*, Vol.36, No.1, Oct., p.51-72.

Rana, Pradumna B., (1981), *ASEAN Exchange Rates: Policies and Trade Effects*, Institute of Southeast Asian Studies, Singapore.

Ranis, Gustav, (1985), "Employment, Income Distribution and Growth in the East Asian Context: A Comparatively Study," in Corbo, Vittorio, Anne O. Krueger, and Fernando Ossa (eds.), *Export-oriented Development Strategies: The Success of Five Newly Industrializing Countries*," Westview Press, Boulder and London.

Reimers, Hans-Eggert, (1992), "Comparisons of Tests for Multivariate Cointegration," *Statistical Papers*, Vol.33, p.335-359.

Reinhard, Christian, (1993), "ASEAN on Way of Economic Integration," *Journal of International Marketing and Marketing Research*, Vol.18, No.1, February, p.3-22.

Riedel, James, (1988), "The Demand for LDC Exports of Manufactures: Estimates from Hong Kong," *Economic Journal*, Vol.98, Iss.389, March, p.138-198.

Roepstorff, Torben M., (1985), "Industrial Development in Indonesia: Performance and Prospects," *Bulletin of Indonesian Economic Studies*, Vol.21, No.1, April, p.32-61.

Runstler, Gerhard, (1994), "The Long-Run Impact of Foreign Shocks to the Austrian Economy: An Analysis at a Sectoral Level," *Applied Economics*, Vol.26, Iss.8, August, p.803-813.

Sabirin, Syahril, (1993), "Exchange Rate Management in an Open Developing Economy: The Case of Indonesia," *Journal of Asian Economics*, Vol.4, No.1, p.207-217.

Said, Said E., and David A. Dickey, (1984), "Testing for Unit Roots in Autoregressive Moving Average Model of Unknown Order," *Biometrika*, Vol.71, p.599-607.

Salvatore, Dominick, (1989), "Exports and Economic Growth with Alternative Trade Strategies," paper presented to the International Economics Study Group Conference, University of Sussex, September.

Samuelson, Paul A., (1965), "Theoretical Notes on Trade Problems," *Review of Economics and Statistics*, Vol.46, p.145-154.

Schenzler, C., (1982), An Empirical Investigation of the Relationship Between Growth of Gross National Product and Exports in Chile, India and South Korea, Unpublished Master's Thesis, Vanderbilt University.

Schwert, G. William, (1987), "Effects of Model Specification on Tests for Unit Roots in Macroeconomic Data," *Journal of Monetary Economics*, Vol.20, July, p.73-103.

Serletis, Apostolos, (1992a), "Export Growth and Canadian Economic Development," *Journal of Development Economics*, Vol.38, p.133-145.

Serletis, Apostolos, (1992b), "The Random Walk in Canadian Output," *Canadian Journal of Economics*, Vol.25, No.2, p.392-406.

Serletis, Apostolos, (1994), "Common Stochastic Trends in a System of East European Black-Market Exchange Rates," *Applied Financial Economics*, Vol.4, p.23-31.

Sheehey, Edmund J., (1990), "Exports and Growth: A Flawed Framework," *The Journal of Development Studies*, Vol.27, No.1, October, p.111-116.

Sheehey, Edmund J., (1992), "Exports and Growth: Additional Evidence," *The Journal of Development Studies*, Vol.28, No.4, July, p.730-734.

Shepherd, W. F., A. Szirmai and D.S. Prasada Rao, (1998), "Indonesian Manufacturing Sector Output and Productivity: An Australian Comparative Perspective, 1975-90," *Bulletin of Indonesian Economic Studies*, Vol.34, No.2, August, p.121-142.

Shiller, Robert J. and Pierre Perron, (1985), "Testing the Random Walk Hypothesis: Power Versus Frequency of Observation," *Economic Letters*, Vol.18, p.381-386.

Sims, Christopher A., (1972), "Money, Income, and Causality," *American Economic Review*, Vol.62, p.540-552.

Sims, Christopher A., (1980), "Macroeconomics and Reality," *Econometrica*, Vol.48, p.1-47.

Singer, Hans W. and Patricia Gray, (1988), "Trade Policy and Growth of Developing Countries: Some New Data," *World Development*, Vol.16, No.3, p.395-403.

Siregar, Reza Yamora, (1996), "Real Exchange Rate Targeting and Inflation in Indonesia: Theory and Empirical Evidence," *Working Paper PB96-07*, Center for Pacific Basin Monetary and Economic Studies, Economic Research Department, Federal Reserve Bank of San Francisco, April.

Sjahrir, and Colin Brown, (1992), "Indonesian Financial and Trade Policy Deregulation: Reform and Response," in MacIntyre, Andrew J. and Kanishka Jayasuriya, (eds.), *The Dynamics of Economic Policy Reform in South-east Asia and the South-west Pacific*, Ch.8, p.124-137.

Soderlind, Paul, and Anders Vredin, (1996), "Applied Cointegration Analysis in the Mirror of Macroeconomic Theory," *Journal of Appied Econometrics*, Vol.11, p.363-381.

Soehoed, A. R., (1988), "Reflections on Industrialization and Industrial Policy in Indonesia," *Bulletin of Indonesian Economic Studies*, Vol.24, No.2, August, p.43-57.

Soesastro, Hadi, and M. Chatib Basri, (1998), "Survey of Recent Developments," *Bulletin of Indonesian Economic Studies*, Vol.34, No.1, April, p.3-54.

Stock, James, (1987), "Asymptotic Properties of Least Squares Estimators Cointegrating Vectors," *Econometrica*, Vol.55, p.1035-1056.

Stock, James H., and Mark W. Watson, (1988), "Testing for Common Trends," *Journal of the American Statistical Association*, Vol.83, No.404, December, p.1097-1107.

Suh, Jang Won, (1994), "Regionalism and the Asia-Pacific Economy: Perspectives and Challenges," *Seoul Journal of Economics*, Vol.7, No.2, p.95-110.

Sundrum, R. M., (1988), "Indonesia's Slow Economic Growth: 1981-86," *Bulletin of Indonesian Economic Studies*, Vol.24, No.1, April, p.37-72.

Suryahadi, Asep, (1999), "The Economic Crisis: Effects and Policy Framework for Its Solution," in Geoff Forrester (ed.) *Post-Soeharto Indonesia: Renewal or Chaos?* Institute of Southeast Asian Studies, Singapore, Ch.10, p.154-160.

Syrquin, M., (1989), "Patterns of Structural Change, " in Hollis Chenery and T.N. Srinivsan (eds.) *Handbook of Development Economics*, Amsterdam: Elsevier.

Tavlas, George S., (1993), "The 'New' Theory of Optimum Currency Areas," *World Economy*, Vol.16, Issue 6, November, p.663-685.

Taylor, Mark P., (1988), "An Empirical Examination of Long-Run Purchasing Power Parity Using Cointegration Techniques," *Applied Economics*, Vol.20, p.1369-1381.

Taylor, Mark P., and Lucio Sarno, (1998), "The Behaviour of Real Exchange Rates During the Post-Bretton Woods Period," *Journal of International Economics*, Vol.46, p.281-312.

Tegene, Abebayehu, (1989), "On the Effectc of Relative Prices and Effective Exchange Rates on Trade Flows of LDCs," *Applied Economics*, Vol.21, p.1447-1463.

Thee, Kian Wie, (1991), "The Surge of Asian NIC Investment into Indonesia," *Bulletin of Indonesian Economic Studies*, Vol.27, No.3, December, p.55-88.

Thirlwall, A. P., (1979), "The Balance of Payments Constraint as an Explanation of International Growth Rate Differences," *Banca Nazionale Del Lavoro Quarterly Review*, Vol. 128, p.44-53.

Thirlwall, A. P., (1980), "Regional Problems are 'Balance-of-payments'Problems," *Regional Studies*, Vol.14, p.419-425.

Thirlwall, A. P., (1997), "Reflections on the Concept of Balance-of-Payments-Constrained Growth," *Journal of Post Keynesian Economics*, Vol.19, Spring, No.3, p.377-385.

Thirlwall, A. P., and R. J. Dixon, (1979), "A Model of Export-Led Growth with a Balance-of-Payments Constraint," in J. K. Bowers, (ed.), *Inflation, Development, and Integration: Essays in Honour of A.J. Brown*, University of Leeds Press.

Thirlwall, A. P., and R. J. Dixon, (1994), "Economic Growth, the Harrod Foreign Trade Multiplier and the Hicks Super-Multiplier,"in McCombie, J.S.L. and A.P. Thirlwall, (eds.), *Economic Growth and the Balance-of-Payments Constraints*, St. Martin's Press, Ch.6, p.392-420.

Thornton, Daniel L., and Dallas S. Batten, (1985), "Lag-Length Selection and Tests of Granger Causality Between Money and Income," *Journal of Money, Credit, and Banking*, Vol.17, May, p.164-178.

Tjiptoherijanto, Prijono, (1993), Macroeconomic Policy and Export Promotion: A Case of Indonesia in the Context of Asean," *Ekonomi dan Keuangan Indonesia*, Vol.41, Nomar 2, p.199-210.

Tseng, Wanda, and Robert Corker, (1991), Financial Liberalization, Money Demand, and Monetary Policy in Asian Countries, International Monetary Fund, Washington, D.C., Occasional Paper, No.84, July.

UNIDO, (1993), *Indonesia: Industrial Development Review*, United Nations Industrial Development Organisation, Vienna.

Urrutia, Jorge L., (1992), "Variance Ratio Tests of Random Walk for Foreign Exchange Rates," *Economics Letters*, Vol.38, p.457-465.

Vahid, F., and Robert F. Engle, (1993), "Common Trends and Common Cycles," *Journal of Applied Econometrics*, Vol.8, p.341-360.

Van Der Meulen Rodgers, Yana, (1996), "Indonesia's Macroeconomic and Trade Performance," *The Journal of Developing Areas*, Vol.30, January, p.149-166.

Vercelli, Alessandro, (1992), "Causality and Economic Analysis: A Survey," in Vercelli, Alessandro and Nicola Dimitri, (eds.), *Macroeconomics: A Survey of Research Strategies*, Oxford University Press, Ch.14, p.393-421.

Voivodas, S. Constantin, (1973), "Exports, Foreign Capital Inflow and Economic Growth," *Journal of International Economics*, Vol.3, No.4, p.337-349.

von Hagen, Jürgen, and Manfred J.M. Neumann, (1994), "Real Exchange Rates Within and Between Currency Areas: How Far Away is EMU?" *The Review of Economics and Statistics*, Vol.76, No.2, May, p.236-244.

Warr, Peter G., (1984), "Exchange Rate Protection in Indonesia," *Bulletin of Indonesian Economic Studies*, Vol.20, No.2, August, p.53-89.

White, Halbert, (1980), "A Heteroscedasticity-ConsistentCovariance Matrix Estimator and a Direct Test for Heteroscedasticity,"*Econometrica*, Vol.50, p.1-25.

Whitt, Joseph A., (1989), "Purchasing-Power Parity and Exchange Rates in the Long Run," Federal Reserve Bank of Atlanta *Economic Review*, July-August, p.18-32.

Williamson, Robert, (1978), "The Role of Exports and Foreign Capital in Latin American Economic Growth," *Southern Economic Journal*, Vol.45, No.2, p.410-420.

Wong, Y. C. Richard, (1999), "Lessons from the Asian Financial Crisis," *Cato Journal*, Vol.18, No.3, Winter, p.391-398.

World Bank, (1994), *East Asia's Trade and Investment: Regional amd Global Gains from Liberalization*, Washington, D.C..

Xu, Zhenhui, (1996), "On the Causality Between Export Growth and GDP Growth: An Empirical Reinvestigation,"*Review of International Economics*, Vol.4, No.2, p.172-184.

Yaghmaian, (1994), "An Empirical Investigation of Exports, Development, and Growth in Developing Countries: Challenging the Neoclassical Theory of Export-Led Growth," *World Development*, Vol.22, No.12, p.1977-1995.

Yamazawa, Ippei, (1980), "Increasing Imports and Structural Adjustment of the Japanese Textile Industry," *Developing Economics*, Vol.18, No.4, p.441-462.

Young, A., (1992), "A Tale of Two Cities: Factor Accumulation and Technical Change in Hong Kong and Singapore," *NBER Macroeconomics Annual*, p.13-54.

Zellner, A., (1962), "An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests for Aggregation Bias," *Journal of American Statistical Association*, Vol.57, p.348-368.

Zivot, Eric, and Donald W.K. Andrews, (1992), "Further Evidence on the Great Crash, the Oil-Price Shock, and the Unit-Root Hypothesis," *Journal of Business & Economic Statistics*, Vol.10, July, No.3, p.251-270.